

**AFRL-ML-WP-TP-2002-401**

**ELECTRONIC AND OPTICAL  
MATERIALS**

**Work Unit Directive (WUD) 48**

**Dr. Gail J. Brown**



**AUGUST 2002**

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## FY88 SCIENTIFIC PUBLICATIONS & PRESENTATIONS

"Neutron Irradiation Effects on the Infrared Absorption of the EL2 Defect in GaAs: New Interpretation for the Intracenter Transition"

M. O. Manasreh, D. W. Fischer, and B. C. Covington, Phys. Rev. B37, 6567 (1988)

"Temperature Dependence of the Figures of Merit for the Blocked Impurity Band Detectors"

F. Szmulowicz, F. Madarasz, and J. Diller, J. Appl. Phys. 63 5583 (1988)

"Synthesis and Characterization of Superconducting YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> Material"

B. Kumar, J. D. Wolf, and S. R. Smith, J. Mater. Sci. Lett. 7, 149 (1988)

"Thermal Properties of Semi-Insulating GaAs Dilutely Alloyed with InAs"

M. C. Ohmer, W. C. Mitchel, G. A. Graves, D. E. Holmes, H. Kuwamoto, and P. W. Yu, J. Appl. Phys. 64, 2775 (1988)

"Thermal Recovery of Photoquenched EL2 Infrared Absorption in GaAs"

D. W. Fischer, Phys. Rev. B37, 2968 (1987)

"An Antimony Related Electronic Level in Isovalently Doped Bulk GaAs"

W. C. Mitchel and P. W. Yu, J. Appl. Phys. 62, 4781 (1987)

"Effects of Coherent Scattering on Infrared Absorption in Doped Semiconductors"

P. J. Grigsby and G. J. Brown, AFWAL-TR-88-4205 Technical Report

"GaAs Material / Device Correlation Study"

J. M. King, D. C. Look, S. Dudley, S. Labovitz, and W. C. Mitchel, AFWAL-TR-87-1188 Technical Report

"The Intrinsic Double Acceptor in Undoped Gallium Arsenide"

W. C. Mitchel and D. W. Fischer, 1988 Materials Laboratory Cleary Award

"Deposition of Thin superconducting Films by Pulsed Laser Evaporations"

T. Murray, World Congress on Superconductivity, Houston, TX (1988)

"Iterative Analytical Solution to Nonlinear Diffusion Equation"

D. S. Moroi, D. Boyd, and P. M. Hemenger, Fall Mts. Ohio Section /APS (1988)

"Observation of Differences in the Quenching of the Photo-current in GaAs Containing EL2 and EL0"

W. C. Mitchel, L. S. Rea, and P. W. Yu, Elec. Mater. Conf. Boulder, CO (1988)

"Photoresponse of Ion Implanted Gallium Dopants in Silicon"

G. J. Brown and J. An. Baker, IRIS IR Materials, Menlo Park, CA (1988)

"Barrier Formation in Graded Hg<sub>1-x</sub>Cd<sub>x</sub>Te Heterojunctions Including a Valence Band Offset"

F. L. Madarasz and F. Szmulowicz, IRIS IR Materials, Menlo Park, CA (1988)

"The Influence of Material Parameters on the Temperature Dependence of the Figures of Merit for the Blocked Impurity Band Detectors"

F. Szmulowicz, F. Madarasz, and J. Diller, IRIS IR Materials, Menlo Park, CA (1988)

"High Temperature Superconducting Ceramics: Applicability to Sensors"

P. M. Hemenger, NATO/AGARD Avionics Panel Subcommittee, Paris, France (1988)

"High Temperature Superconducting Ceramics: Applicability to Sensors"

P. M. Hemenger and L. G. Riffie, NAECON National Mtg., Dayton, OH (1988)

## 8.0 FY89 SCIENTIFIC PUBLICATIONS & PRESENTATIONS

"Photoreflectance Measurements of Unintentional Impurities in Undoped GaAs"  
M. Sydor, J. Angelo, W. C. Mitchel, T. W. Haas, and Ming-Yuan Yen  
J. Appl. Phys. 66, 156 (1989)

"The EL2 Defect in GaAs: Some Recent Developments" (Invited Review Article)  
M. O. Manasreh, D. W. Fischer, and W. C. Mitchel  
Phys. Stat. Sol. (b)154, 11 (1989).

"Persistent Photocurrent in Semi-Insulating GaAs and Its Relationship to the Deep Donor EL2"  
W. C. Mitchel, David W. Fischer, and M. O. Manasreh  
Solid State Commun. 71, 337 (1989).

"Photoresponse of Ion Implanted Gallium Dopants in Silicon"  
G. J. Brown and J. A. Baker  
Infrared Phys. 29, 43 (1989).

"Noncreation of the EL2 Defect in Neutron-Irradiated GaAs"  
M. O. Manasreh and D. W. Fischer  
Phys. Rev. B40, 5814 (1989).

"Observation of the Second Energy Level of the EL2 Defect in GaAs by the Infrared Absorption Technique  
M. O. Manasreh, W. C. Mitchel, and D. W. Fischer  
Appl. Phys. Lett. 55, 864 (1989).

"The Flux, Temperature, and Energy Dependence of Dislocation Pinning in Electron-Irradiated Gold"  
G. J. Brown, J. W. Hemsky, and H. M. Simpson  
J. Phys. 1, 4543 (1989).

"Photoquenching and Photoinduced-Recovery Properties of the EL2 Defect in GaAs: Evidence Against the Identification of EL2 with the Isolated As<sub>Ga</sub> Defect"  
M. O. Manasreh and D. W. Fischer  
Phys. Rev. B39, 13001 (1989)

"Absence of a Persistent Photocurrent in Undoped Semi-insulating Bridgman GaAs Containing EL2 and Carbon"  
W. C. Mitchel  
Phys. Rev. B39, 10390 (1989).

"Temperature Dependence of the Photoinduced EL2\*  $\rightarrow$  EL2<sup>0</sup> Recovery Process Observed by Infrared Absorption  
D. W. Fischer and M. O. Manasreh  
Appl. Phys. Lett. 54, 2018 (1989).

"Determination of Shallow Minority-Acceptor Concentration in Multiply Doped Silicon  
G. Bambakidis and G. J. Brown  
J. Appl. Phys. 65, 3270 (1989).

"Influence of Solute Doping on the High-Temperature Deformation Behavior of GaAs"  
S. Guruswamy, R. S. Rai, K. T. Faber, J. P. Hirth, S. McGuigan, R. N. Thomas, and W. Mitchell  
J. Appl. Phys. 65, 2508 (1989).

"The Effects of Long-Term Annealing on Superconducting Properties in the Bi-Sr-Ca-Cu-O System"  
Asok K. Sarkar, Binod Kumar, I. Maartense, and T. L. Peterson  
J. Appl. Phys. 65, 2392 (1989).

"Electron Paramagnetic Resonance Identification in the SbGa Heteroantisite Defect in GaAs:Sb  
M. Baeumler, J. Schneider, U. Kaufmann, W. C. Mitchell, and P. W. Yu  
Phys. Rev. B 39, 6253 (1989).

"Electron Irradiation Effects on the Infrared Absorption Properties of the EL2 Defect in GaAs"  
M. O. Manasreh and D. W. Fischer  
Phys. Rev. B 39, 3871 (1989).

"Observation of Differences in the Quenching of the Photo-current in GaAs Containing EL2 and EL0"  
W. C. Mitchell, Laura S. Rea, and P. W. Yu  
J. Elec. Matls. 18, 209 (1989).

"Persistent Photo-Current in Semi-Insulating, Undoped GaAs and Its Relationship to the Deep Donor EL2"  
W. C. Mitchell, D. W. Fischer, and M. O. Manasreh  
Solid State Commun. 71, 337 (1989).

"Infrared Absorption Properties of the EL2 and the Isolated AsGa Defects in Neutron-Transmutation Doped GaAs: Generation of an EL2-like Defect"  
M. O. Manasreh and D. W. Fischer  
Phys. Rev. B 39, 3239 (1989)

"Photoluminescence Bands of Deep Centers in Neutron-Transmutation Doped GaAs"  
M. O. Manasreh and S. M. Mudare  
Semicond. Sci. Technol. 4, 435 (1989)

"Calculation of the Lattice Thermal Conductivity in GaAs-InAs Alloys and Comparison with Experiment"  
Frank Szmulowicz, Frank L. Madarasz, Paul G. Klemens, and Jeffrey Diller  
J. Appl. Phys. 66, 252 (1989).

"Observation of a Deep Level Due to In Doping in p-type GaAs"  
S. R. Smith, A. O. Evwaraye, and W. C. Mitchell  
J. Appl. Phys. 65, 1130 (1989).

"Ultrasonic Attenuation Peaks Near the Diffuse Transition Temperature in Solid Electrolytes with Fluorite Structure"  
M. O. Manasreh, D. O. Pederson, and T. S. Aurora  
Proc. Mat. Res. Soc. 135, 309 (1989).

"Optical Absorption of the Isolated As<sub>Ga</sub> Antisite and an EL2-Like Defect in Neutron-Transmutation Doped GaAs"

M. O. Manasreh and D. W. Fischer  
Proc. Mat. Res. Soc. 138, 273 (1989).

"Linearity of Direct Injection in an InSb Photodiode/Si Charge-Coupled Device Imager"

F. K. Hopkins and J. T. Boyd  
Optical Engineering 27, 701 (1988).

"Electron Paramagnetic Resonance of Isolated As<sub>Ga</sub><sup>+</sup> Antisite Defect in Neutron-Transmutation Doped Semi-Insulating GaAs"

M. O. Manasreh, P. F. McDonald, S. A. Kivlighn, J. T. Minton, and B. C. Covington  
Solid State Commun. 65, 1267 (1988).

"Infrared Absorption of Electron Irradiation-Induced Deep Defects in Semi-Insulating GaAs"

M. O. Manasreh and D. W. Fischer  
Appl. Phys. Lett. 53, 2429 (1988)

"The Effect of Shallow Residual Impurities on the Hopping Activation Energy in Semiconductors"

Frank Szmulowicz and Kenneth T. Bloch  
Phys. Rev. B 38, 8480 (1988).

"The Effect of a Valence-Band Offset on Barrier Formation in Graded Hg<sub>1-x</sub>Cd<sub>x</sub>Te Heterojunctions"

Frank L. Madarasz and Frank Szmulowicz  
J. Appl. Phys. 64, 6373 (1988).

WRDC-TR-89-5015, GaAs Material/Device Correlation Study (Inhouse, Limited Distribution).

"Effects of Different Fabrication Techniques on the Yttrium-Barium-Copper Oxide High Temperature Superconductor"

Paul A. Rhea  
AFIT/GE/ENG/88D-42

"EL2 and Other Deep Donors in Semi-Insulating GaAs"

D. W. Fischer and W. C. Mitchel, 1989 Cleary Award (Finalists).

"Measurement of Nonlinear Optical Properties of Oxide Thin Films"

D. E. Zelmon  
Tennessee Valley Chapter of the American Vacuum Society, Oak Ridge, TN (May 1989) (Invited)

"A Monte Carlo Model of Thin Film Growth"

D. L. Dorsey and F. Szmulowicz  
1989 Spring Meeting of Ohio Section/APS, Oxford, OH (April 1989).

"Modeling of MBE Growth of III-V Semiconductors: Literature Review and Preliminary Model Results"

D. L. Dorsey  
Invited Lecture, Washington University, St. Louis, MO (March 1989).

"Equilibrium Barrier Formation in p-on-N and P-on-n Graded HgCdTe Heterojunctions"  
Frank L. Madarasz and Frank Szmulowicz  
SPIE Technical Symposia on Aerospace Sensing, Orlando, FL (March 1989).

"Recent Experimental Measurements and Analyses of the Native EL2 Defect in GaAs"  
M. O. Manasreh  
Fall Meeting of the Materials Research Society, Boston, MA (Nov-Dec 1988).

"Examination of the Effects of Different Fabrication Techniques on the Barium-Yttrium-Copper-Oxide High Temperature Superconductor"  
P. Rhea, Y. Yeo, R. Hengehold, P. Hemenger, I. Maartense, T. Peterson, M. Battison, and R. Kerans  
1988 Fall Meeting of Ohio Section/APS, Toledo, OH (Oct 1988).

## 8.0 FY90 SCIENTIFIC PUBLICATIONS & PRESENTATIONS

### 8.1 Publications

1. Michael Sydor, Neal Jahren, W. C. Mitchel, W. V. Lampert, T.W. Haas, M. Y. Yen, S. M. Mudare, and D. H. Tomich, "Photorefectance of  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  and  $\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{GaAs}$  Interfaces and High-Electron-Mobility Transistors", J. Appl. Phys. 67, 7423 (1990).
2. Michael Sydor, James Angelo, Jerome J. Wilson, W. C. Mitchel, and M. Y. Yen, "Photorefectance from GaAs and GaAs/GaAs Interfaces", Phys. Rev. B40, 8473 (1989).
3. C. R. Abernathy, S. J. Pearton, M. O. Manasreh, D. W. Fischer, and D. N. Talwar, "Incorporation of Carbon in Heavily Doped  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  Grown by Metalorganic Molecular Beam Epitaxy", Appl. Phys. Lett. 57, 294 (1990).
4. W. C. Mitchel, D. W. Fischer, Laura S. Rea, and P. W. Yu, "Anomalous Photoquenching in Semi-insulating GaAs Attributed to the Presence of the Deep Donor ELO", Phys. Rev. B40, 8431 (1989).
5. M. O. Manasreh and D. W. Fischer, "Quenching and Recovery Characteristics of the EL2 Defect in GaAs Under Monochromatic-Light Illumination", Phys. Rev. B40, 11756 (1989).
6. W. C. Mitchel and Ronald E. Perrin, "Temperature Dependence of the Persistent Photocurrent in Czochralski Gallium Arsenide", Phys. Rev. B41, 12086 (1990).
7. S. Ravipati, P. W. Yu, B. E. Taylor, and W. C. Mitchel, "Photorefectance Measurements of Indium Content in Semi-insulating Indium-alloyed GaAs Bulk Substrates", Proc. SPIE Int'l Conf. on Modulation Spectroscopy 1286, 66 (1990).
8. M. O. Manasreh and G. J. Brown, "The Double Donor Issue of the EL2 Defect in GaAs", in Impurities, Defects and Diffusion in Semiconductors: Bulk and Layered Structures, Proc. Materials Research Soc. 163, 809 (1990).
9. M. O. Manasreh and D. W. Fischer, "Recovery from the Metastable EL2 Defect in GaAs Under Monochromatic Light Illumination", Proc. Materials Research Soc. 163, 827 (1990).
10. G. J. Brown and W. C. Mitchel, "Mid-infrared Spectral Photoresponse of Semi-insulating GaAs", Proc. Materials Research Soc. 163, 157 (1990).
11. D. W. Fischer and M. O. Manasreh, "The Effect of Charge State on the Local Vibrational Mode Absorption of the Carbon Acceptor in Semi-Insulating GaAs", J. Appl. Phys. 68, 2504 (1990).
12. M. O. Manasreh, W. C. Mitchel, and D. W. Fischer, "Far-infrared Absorption from Shallow Acceptors and its Relationship to the Persistent Photocurrent in Semi-insulating GaAs", Semicond. Sci. Technol. 5, 994 (1990).
13. P. W. Yu, S. Ravipati, B. E. Taylor, and W. C. Mitchel, "Photorefectance Measurements of Indium Content in Indium-Alloyed Semi-insulating GaAs Substrates", J. Appl. Phys. 67, 1471 (1990).
14. T. L. Peterson, F. Szmulowicz, and P. M. Hemenger, "Electrical Transport Analysis of Ultra-Pure Silicon", J. Cryst. Growth 106, 16 (1990).
15. Frank Szmulowicz and Frank L. Madarasz, "Valence Band Barrier Formation in Graded  $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$  Heterojunctions With a Valence Band Offset Included", J. Appl. Phys. 66, 3082 (1989).

16. Rabi S. Bhattacharya, P. B. Kosel, and T. Peterson, "High  $T_c$  Superconductor Multilevel Structures Formed with  $Ta_2O_3$  Spacer Layers", *Proc. Materials Research Soc.* **169** (1990).
17. J. A. Schultz and P. T. Murray, "Surface Analysis of H, C, O, Y, Ba, and Cu on Pressed and Laser Evaporated  $YBa_2Cu_3O_7$ ", in High  $T_c$  Superconducting Thin Films. Devices, and Applications, G. Margaritondo, R. Joynt, and M. Ouellion, eds., American Institute of Physics, New York (1989).
18. I. Bransky, J. Bransky, I. Maartense, and T. L. Peterson, "Dependence of Transport Critical Current Density on Sample Size for Ceramic  $RBa_2Cu_3O_{7-x}$  ( $R=Y, Ho, Gd$ )", *J. Appl. Phys.* **66**, 5510 (1989).
19. Asok K. Sarkar, I. Maartense, Binod Kumar, and T. L. Peterson, "Effect of Sintering Temperature on the Superconductive Properties of  $Bi(Pb)-Sr-Ca-Cu-O$  Ceramics", *Supercond. Sci. Technol.* **3**, 199 (1990).
20. Asok K. Sarkar, I. Maartense, T. L. Peterson, and Binod Kumar, "Preparation and Characterization of Superconducting Phases in the  $Bi(Pb-Sr-Ca-Cu-O)$  System", *J. Appl. Phys.* **66**, 3717 (1989).
21. R. E. Perrin, "Computer Controlled Cryogenic Temperature Controller", WRDC-TR-89-4140 (In-house).

## 8.2 Presentations

1. P. G. Schunemann, T. M. Pollak, P. A. Budni, H. H. Zenzie, and F. K. Hopkins, "Synthesis and Single Crystal Growth of  $ZnGeP_2$ ", *Conf. on Crystal Growth*, Vail, CO (July 1990).
2. P. G. Shunemann, T. M. Pollak, P. A. Budni, H. H. Zenzie, and F. K. Hopkins, "Growth and Characterization of  $ZnGeP_2$  for Optical Parametric Oscillator Applications", *Fifth Topical Meeting on Advanced Solid-State Lasers*, Salt Lake City, UT (March 1990).
3. S. Ravipati, P. W. Yu, B. E. Taylor, and W. C. Mitchel, "Photoreflectance Measurements of Indium Content in Semi-Insulating Indium-alloyed GaAs Bulk Substrates", *Int'l Conf. on Modulation Spectroscopy*, SPIE, San Diego, CA (March 1990).
4. Frank Szmulowicz, M. O. Manasreh, D. W. Fischer, F. Madarasz, K. R. Evans, E. Stutz, and T. Vaughan, "Temperature Dependence of Intersubband Absorption in a Barrier-Doped  $GaAs/Al_{0.3}Ga_{0.7}As$  Quantum Well Structure", *5th Int'l Conf. on the Physics of Electro-Optic Microstructures and Microdevices*, Heraklion, Crete (July-Aug 1990).
5. D. L. Dorsey and F. Szmulowicz, "A Monte Carlo Model of Thin Film Growth by Molecular Beam Epitaxy", *1989 Annual Meeting of the AIChE*, San Francisco, CA (Nov 1989).
6. K. A. Pandelisev, R. B. Bult, W. C. Mitchel, S. Felch, G. Maracas, and D. Johnson, "EL2 and 0.42 eV Level Generation During Bulk Crystal Annealing", *6th Conf. on Semi-Insulating III-V Materials*, Toronto (May 1990).
7. G. J. Brown and W. C. Mitchel, "Mid-infrared Spectral Photoresponse of Semi-insulating GaAs", *MRS Fall Meeting*, Boston, MA (Nov 1989).
8. M. O. Manasreh and G. J. Brown, "The Double Donor Issue of the EL2 Defect in GaAs", *MRS Fall Meeting*, Boston, MA (Nov 1989).

9. M. O. Manasreh and D. W. Fischer, "Recovery from the Metastable EL2 Defect in GaAs Under Monochromatic Light Illumination," MRS Fall Meeting, Boston, MA (Nov 1989).
10. T. L. Peterson, F. Szmulowicz, and P. M. Hemenger, "Electrical Transport Analysis of Ultra-Pure Silicon" (Invited), Third Workshop on Purification of Materials for Crystal Growth and Glass Processing, Orlando, FL (Oct-Nov 1989).
11. D. L. Dorsey, P. A. Ramachandran, and M. P. Dudukovic, "A Boundary Layer Analysis of Oxygen Evaporation from a Czochralski-Silicon Melt", 1989 Meeting of the AIChE, San Francisco, CA (Nov 1989).
12. D. L. Dorsey, P. A. Ramachandran, and M. P. Dudukovic, "Oxygen Transport in Czochralski Silicon Crystal Growth", 1989 Meeting of the AIChE, San Francisco, CA (Nov 1989).
13. P. M. Hemenger, T. L. Peterson, R. Fletcher, I. Maartense, P. T. Murray, and D. W. Chung, "Fabrication and Characterization of High Temperature Superconducting Thin Films for Sensors and Electronics", NATO/AGARD Mtg. on Applications of Superconductivity to Avionics, Bath, U.K. (May 1990).
14. D. W. Chung, T. L. Peterson, R. Fletcher, P. M. Hemenger, I. Maartense, and P. T. Murray, "Electrical and Magnetic Analysis of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  Superconducting Films Grown by Laser Ablation", Conf. on the Science and Technology of Thin Film Superconductors, Denver, CO (May 1990).
15. Rabi S. Bhattacharya, Peter B. Kosel, and T. Peterson, "High  $T_c$  Superconductor Multilevel Structures Formed with  $\text{Ta}_2\text{O}_3$  Spacer Layers", MRS Fall Meeting, Boston, MA (Nov 1989).
16. R. E. Perrin and S. B. Fairchild, Laboratory Applications of Artificial Intelligence: An Expert System for the Analysis of Impurities in Electronic Materials (1990 Schwartz).

## 9.0 FY90 INTERACTIONS

### 9.1 WITH OTHER WUDs

A major portion of the WUD#48 program continued to focus on materials grown in the ML/MBE machine in WUD#50, *Surface and Interface Properties*. This includes all aspects of materials design, process modeling, and characterization.

Integral to the WUD#50 collaboration is participation with WUD#54, *Manufacturing Research*, on the project to apply AI to MBE material processing. WUD#48 supplies experimental data and expert consultation.

Part of the non-linear optical (NLO) materials research is in collaboration with WUD#26, *Laser Hardened Optical Materials*, and WUD#43, *Polymeric Materials*. These groups are growing organic thin films inhouse and WUD#48 is participating in their characterizations.

The inhouse project applying artificial intelligence (AI) to an experimental system was developed with support from WUD#26. A small activity continues as the final graphics software is tuned-up and the documentation is completed.

9. M. O. Manasreh and D. W. Fischer, "Recovery from the Metastable EL2 Defect in GaAs Under Monochromatic Light Illumination," MRS Fall Meeting, Boston, MA (Nov 1989).
10. T. L. Peterson, F. Szmulowicz, and P. M. Hemenger, "Electrical Transport Analysis of Ultra-Pure Silicon" (Invited), Third Workshop on Purification of Materials for Crystal Growth and Glass Processing, Orlando, FL (Oct-Nov 1989).
11. D. L. Dorsey, P. A. Ramachandran, and M. P. Dudukovic, "A Boundary Layer Analysis of Oxygen Evaporation from a Czochralski-Silicon Melt", 1989 Meeting of the AIChE, San Francisco, CA (Nov 1989).
12. D. L. Dorsey, P. A. Ramachandran, and M. P. Dudukovic, "Oxygen Transport in Czochralski Silicon Crystal Growth", 1989 Meeting of the AIChE, San Francisco, CA (Nov 1989).
13. P. M. Hemenger, T. L. Peterson, R. Fletcher, I. Maartense, P. T. Murray, and D. W. Chung, "Fabrication and Characterization of High Temperature Superconducting Thin Films for Sensors and Electronics", NATO/AGARD Mtg. on Applications of Superconductivity to Avionics, Bath, U.K. (May 1990).
14. D. W. Chung, T. L. Peterson, R. Fletcher, P. M. Hemenger, I. Maartense, and P. T. Murray, "Electrical and Magnetic Analysis of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  Superconducting Films Grown by Laser Ablation", Conf. on the Science and Technology of Thin Film Superconductors, Denver, CO (May 1990).
15. Rabi S. Bhattacharya, Peter B. Kosel, and T. Peterson, "High  $T_c$  Superconductor Multilevel Structures Formed with  $\text{Ta}_2\text{O}_3$  Spacer Layers", MRS Fall Meeting, Boston, MA (Nov 1989).
16. R. E. Perrin and S. B. Fairchild, Laboratory Applications of Artificial Intelligence: An Expert System for the Analysis of Impurities in Electronic Materials (1990 Schwartz).

## 8.0 FY91 SCIENTIFIC PUBLICATIONS & PRESENTATIONS

### 8.1 Publications

"Response to 'Comment on 'The Effect of Charge State on the Local Vibrational Mode Absorption of the Carbon Acceptor in Semi-insulating GaAs' " [J. Appl. Phys. 68, 2504 (1990)]"

D.W. Fischer and M.O. Manasreh  
J. Appl. Phys. 69, 6733 (1991)

"Molecular Beam Epitaxial Growth of Epitaxial Barium Silicide, Barium Oxide and Barium Titanate on Silicon"

R.A. McKee, F.J. Walker, J.R. Conner, E.D. Specht, and D.E. Zelmon  
Appl. Phys. Lett. 59, 782 (1991)

"Calculation of Gallium-Arsenic-Metal Phase Diagrams"

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"XPS Characterization of Low Temperature MBE Grown GaAs (111) Layer"

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"Nonlinear Optical Materials in the Air Force's Materials Directorate"

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"Local-mode Spectroscopy and Model Study for Assessing the Role of Light Defects in III-V Compound Semiconductors"

D.N. Talwar, M.O. Manasreh, D.W. Fischer, S.J. Pearton, and G. Matous  
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"Intersubband IR Absorption in GaAs/Al<sub>0.3</sub>Ga<sub>0.7</sub>As Multiple Quantum Well"

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## 8.0 FY92 SCIENTIFIC PUBLICATIONS & PRESENTATIONS

### 8.1 Publications

"Indirect Photoreflectance from High-electron-mobility Transistor Structures"

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"Limit of Superconductivity in Silver/Superconductor Metal-Matrix Composites Prepared with Bi-Pb-Sr-Ca-Cu-O Ceramic Powders"  
A.K. Sarkar, I. Maartense, and T.L. Peterson,  
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John A. Detrio  
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## 8.2 Accepted for Publication

"DLTS and Admittance Spectroscopy of  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}$  Grown by Gas Source Molecular Beam Epitaxy"  
S. H. Li, P. K. Bhattacharya, S. R. Smith and W. C. Mitchel  
Proc. Twelfth North American Conf. on MBE

"Deep Levels in Undoped  $\text{Si}_{1-x}\text{Ge}_x$  Grown by Gas-Source Molecular Beam Epitaxy"  
S.H. Li, P.K. Bhattacharya, S.W. Chung, S. R. Smith and W.C. Mitchel  
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"Growth and Photoluminescence of Liquid Phase Electroepitaxially Grown  $\text{GaSb}$  and  $\text{GaInAsSb}$  on  $\text{GaSb}$ "  
S. Iyer, S. Hegde, Ali Abdul-Fadl, K. K. Bajaj and W. Mitchel  
Physical Review B

"MBE Growth Surface Roughening Kinetics of  $\text{Ge}$  (001) - A Theoretical Study"  
R. Venkatasubramanian and D. L. Dorsey  
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"A Shubnikov-de Haas Study in the Strained  $\text{Al}_{0.6}\text{Ga}_{0.4}\text{Sb}/\text{InAs}/\text{Al}_{0.6}\text{Ga}_{0.4}\text{Sb}$  Quantum Wells"  
Ikai Lo, W.C. Mitchel, M.O. Manasreh, C.E. Stutz, and K.R. Evans  
Proc. SOTAPOCS XV (Oct 1991)

"Calculation and Measurement of the Electron Density and Temperature Dependence of the Intersubband Absorption in n-type  $\text{GaAs}/\text{Al}_{0.3}\text{Ga}_{0.7}\text{As}$  Quantum Well"  
F. Szmulowicz, T. Vaughan, M. O. Manasreh and C. E. Stutz  
Proc. of the 21st International Conference on the Physics of Semiconductors, Beijing, China August 1992

"Isochronal Annealing of Local Vibrational Modes in Proton- and Deuteron-Implanted  $\text{InP}$ "  
D.W. Fischer, M.O. Manasreh and G. Matous  
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"Infrared Absorption in Proton- and Deuteron Implanted Semi-Insulating  $\text{InP:Fe}$ "  
D.W. Fischer, M.O. Manasreh, G. Matous, and S.J. Pearton  
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"Optical Waveguides Fabricated by Ion-implantation of  $\text{Si}^+$  and  $\text{N}^+$  in  $\text{SiO}_2$  : A Raman Investigation"  
U. B. Ramabadran, H. E. Jackson and J. T. Boyd  
Optics Letters

"Optical Anisotropy of Polymeric Films Measured by Waveguide Propagation Mode Determination"  
S.J. Bai, R.J. Spry, D.E. Zelmon, U. Ramabadran, and J. Jackson  
J. of Polymer Sci., Phys. Sec.

"Heat Transport Through MBBA due to Induced Electrohydrodynamic Motion"  
R.R. Biggers, J. Rish III, and R. Fuller  
J. Mol. Crys.-Liq. Crys.

### 8.3 Submitted for Publication

"DLTS and Admittance Spectroscopy of  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}$  Grown by Gas Source Molecular Beam Epitaxy"  
S. H. Li, P. K. Bhattacharya, S. R. Smith and W. C. Mitchel  
J. Electrochem. Soc.

"The ROHF Extension of the Quantum Theory of Valence, Bonding and the Statistical Spin Population Analysis"  
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"Effect of Deep Levels on the C-V Profile of GaAs/AlGaAs Heterojunctions"  
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"Photoluminescence Study of Liquid Phase Electroepitaxially Grown GaInAsSb on (100) GaSb"  
S. Iyer, S. Hegde, K.K. Bajaj, Ali Abul-Fadl, and W.C. Mitchel  
Appl. Phys. Lett

"ZnGeP<sub>2</sub> Grown by the Liquid Encapsulated Czochralski Method"  
H.M. Hobgood, T. Henningsen, R.N. Thomas, R.H. Hopkins, M.C. Ohmer, W.C. Mitchel, D.W. Fischer, F.K. Hopkins, and S.M. Hegde  
J. Appl. Physics

"Observation of Surface Defects in 6H-SiC Wafers"  
A.O. Evwaraye, S.R. Smith, M. Skowronski and W.C. Mitchel  
J. Appl. Phys.

### 8.4 Presentations

"DLTS and Admittance Spectroscopy of  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}$  Grown by Gas Source Molecular Beam Epitaxy"  
S. H. Li, P. K. Bhattacharya, S. R. Smith and W. C. Mitchel  
Twelfth North American Conf. on MBE, Toronto, Canada, 12-14 October 92

"Semiconductor Surface Atom Energetics by Quantum Chemistry"  
S. G. Das  
MLPJ Symposium on Computational Material Science, July 16, 1992

"Semi-empirical Self-consistent calculations of GaAs [111]B Surface Reconstructions"  
S. G. Das, D. L. Dorsey  
Ohio Section of the American Physical Society, Ohio, October 11, 1991

"Application of Cellular Automata and Process Discovery to Vapor Phase Epitaxy"

D. L. Dorsey

Workshop on Computational Material Science via Digital Physics, Wright-Patterson AFB, Ohio, 22-23 April, 1992

"Application of Computational Chemistry Techniques to Modeling of Semiconductor Thin-Film Epitaxy"

D. L. Dorsey

Symposium on Computational Materials Science for Hardened Materials Research, Wright-Patterson AFB, Ohio, 15-16 July, 1992

"Semi-empirical Self-consistent calculations of the (2X2) and  $\sqrt{19}\times\sqrt{19}$  Surface Reconstruction of GaAs [111]B"

S. G. Das, D. L. Dorsey

Gordon Conference on Computational Chemistry, New Hampton, NH, June 29, 1992

"Semi-empirical Self-consistent calculations of GaAs [111]B Surface Reconstructions"

S.G. Das, D.L. Dorsey

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"Calculation and Measurement of the Electron Density and Temperature Dependence of the Intersubband Absorption in n-type GaAs/ $\text{Al}_{0.3}\text{Ga}_{0.7}\text{As}$  Quantum Well"

F. Szmulowicz, T. Vaughan, M.O. Manasreh and C.E. Stutz

21st International Conference on the Physics of Semiconductors, Beijing, China August, 1992.

"Theoretical Modeling of the Intersubband Transition in an GaAs/ $\text{Al}_{0.3}\text{Ga}_{0.7}\text{As}$  Multiple Quantum Well Structure"

T. Vaughan, F. Szmulowicz, M.O. Manasreh, K.R. Evans and C. E. Stutz

Ohio Section of the American Physical Society, Ohio, October 11, 1991

"Calculation and Measurement of the Electron Density and Temperature Dependence of the Intersubband Absorption in n-type GaAs/ $\text{Al}_{0.3}\text{Ga}_{0.7}\text{As}$  Multiple Quantum Wells"

F. Szmulowicz, T. Vaughan, M.O. Manasreh and C.E. Stutz

Bull. Am. Phys. Soc. 36, 2742 (1991)

"Shubnikov-de Haas studies of negative persistent photoconductivity in AlGaSb/InAs quantum wells"

Ikai Lo, W. C. Mitchel, M. O. Manasreh, C. E. Stutz and K. R. Evans

Symposium on Advanced III-V Compound Semiconductor, Growth, Processing and Devices, 1991 MRS Fall Meeting, Boston, MA, Mat. Res. Soc. Abst., 198 (1991)

"Electron effective mass in  $\text{Al}_x\text{Ga}_{1-x}\text{Sb}/\text{InAs}$  single quantum wells"

M.O. Manasreh, C.E. Stutz, K.R. Evans, G. Gumbs, Ikai Lo and W.C. Mitchel

APS March Meeting, Bull. Am. Phys. Soc. 37, 234 (1992)

"Study of a two dimensional electron gas by a new approach in modulation spectroscopy"

Ali Badakhshan, M. Sydor, and W.C. Mitchel

AVS Meeting, Seattle, November 1991

"Effect of Al composition on the deep level donors of  $\text{Al}_x\text{Ga}_{1-x}\text{Sb}/\text{InAs}$  single quantum wells"

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I. Lo, W.C. Mitchel, M.O. Manasreh, C.E. Stutz and K.R. Evans  
APS March Meeting, Bull. Am. Phys. Soc. 37, 358 (1992)

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M.O. Manasreh, C.E. Stutz, K. R. Evans, G. Gumbs, I. Lo and W.C. Mitchel  
Bull. APS 37, (1992)

"A Shubnikov-de Haas study in the strained  $\text{AlGaSb}/\text{InAs}/\text{AlGaSb}$  quantum wells"

I. Lo, W.C. Mitchel, M.O. Manasreh, C.E. Stutz and K.R. Evans  
SOTAPOCS XV, Electronics, Dielectric Science and Technology Divisions, The Electrochemical Society Inc. October 13-18, 1991

"Intersubband Infrared Absorption in a  $\text{GaAs}/\text{Al}_{0.3}\text{Ga}_{0.7}\text{As}$  Multiple Quantum Well"

T. Vaughan, F. Szmulowicz, M.O. Manasreh, K.R. Evans, C.E. Stutz and D.W. Fischer  
APS Meeting, Indianapolis, IN, March 16-20, 1992

"Low Temperature Photoluminescence and Absorption Investigation of Nonlinear Optical Material  $\text{ZnGeP}_2$ "

S.M. Hegde, M.C. Ohmer, W.C. Mitchel, D.W. Fischer and P.G. Schuneman  
APS March Meeting Bulletin 37, 304-305, Indianapolis, IN, March 16-20, 1992

"Properties of  $\text{ZnGeP}_2$  and Possible Device Applications"

M.C. Ohmer  
University of Pittsburgh, Dept. of Electrical Engineering Colloquium, May 27, 1992

"Photoluminescence studies of  $\text{ZnGeP}_2$ "

S.M. Hegde  
Workshop on  $\text{ZnGeP}_2$  and related Semiconductor Materials, Cincinnati, Ohio, June 16-17, 1992

"Near Infrared Absorption in  $\text{ZnGeP}_2$ "

P.G. Schuneman, T.M. Pollack, M.C. Ohmer, P.J. Drevinsky  
Tenth International Conference on Crystal Growth ICCG-10, 16 August, 1992

"Low Temperature Photoluminescence and Absorption Investigation of Nonlinear Optical Material  $\text{ZnGeP}_2$ "

M. C. Ohmer  
Workshop on  $\text{ZnGeP}_2$  and Related Semiconductor Materials, University of Cincinnati, June 16-17, 1992

"Electron Beam Processing of  $\text{ZnGeP}_2$ "

N. Fernilius  
Workshop on  $\text{ZnGeP}_2$  and Related Semiconductor Materials, University of Cincinnati, June 16-17, 1992

"Laser Calorimetry"

J. Detrio  
Workshop on  $\text{ZnGeP}_2$  and Related Semiconductor Materials, University of Cincinnati, June 16-17, 1992

"Zinc Germanium Phosphide Development"

M. C. Ohmer and F. K. Hopkins  
TTCP workshop on nonlinear optics, Malvern, UK, 21 May 1992

"IR Absorption in Proton- and Deuteron-Implanted Semi-Insulating InP:Fe"

D.W. Fischer, M.O. Manasreh and G. Matous

7<sup>th</sup> Conference on Semi-insulating III-V Materials, Ixtapa, Mexico 21-24, April 1992

"Nonlinear materials in the U. S. Air Force Wright Laboratory"

F. K. Hopkins

TTCP workshop on nonlinear optics, Malvern, UK, 21 May 1992

"Refractive indices and Dielectric Properties of Deuterated Zinc Tris Thiourea Sulfate"

David E. Zelmon, Uma B. Ramabadran and F. Kenneth Hopkins

Optical Soc. of America Nonlinear Optics: Materials, Fundamentals and Applications, Maui, Hawaii, Aug. 17, 1992

"Perturbation Theory for Nonlinear Wave Equations in a  $\chi_2$  Medium"

N. Amarsinghe, D.S. Moroi and David E. Zelmon

ALCOM Conference, Cuyahoga Falls, Ohio, May 28, 1992

"Processing and Optical Analysis of Polymeric Films"

S.J. Bai, G.A. Balchin, C.Y-C Lee, R. Mehta, J. Promislow, U. Ramabadran, R.J. Spry, T. Vaughan and David E. Zelmon

Air Force Nonlinear Optical Polymers Conference, Wright-Patterson AFB, Ohio, December 8-10, 1991

"Corrections to the slowly varying amplitude approximation in a  $\chi_2$  optical medium"

N. Amarsinghe, D.S. Moroi and David E. Zelmon

Ohio Section of the American Physical Society, Ohio, October 11, 1991

"Rain Impact Testing of Durable Coatings on Water Clear ZnS"

John A. Detrio

SPIE International Symposium on Optical Applied Science and Engineering, Window and Dome Technologies and Materials III, San Diego, CA, July 1992

## 6.0 FY93 PATENTS, SCIENTIFIC PUBLICATIONS, & PRESENTATIONS

### 6.1 Patents

"Transparent Semiconductor Crystals"

M.C. Ohmer

Number 07/920,699, AF Invention 20180, Granted 1993

"Optical Modulation and Switching with Enhanced Third-Order Nonlinearity Multiple Quantum Well Effects"

F.K. Hopkins, J.T. Boyd, and H.E. Jackson

Number 07/878,272, Granted 1993

"High Contrast Switchable Target Discriminator"

F. Kenneth Hopkins

Number 5,118,191; June 2, 1992

"Fluorescent Object Recognition System Having Self-modulated Light Source"

F. Kenneth Hopkins

Number 4,642,526; February 10, 1987

"Electrically Controlled Liquid-Crystal Heat Valve"

Rand R. Biggers, J.W. Rish III, G.L. Henderson, C.N. Pham, and R.R. Fuller

Number 5,222,548; June 29, 1993

"Liquid-Crystal Heat Valve Controlled with Multiple Electrode Pairs"

M.E. Stefanov, Rand R. Biggers, J.W. Rish III, G.L. Henderson, and C.N. Pham

Number 5,188,171; February 23, 1993

### 6.2 Publications

Magnetic-Field-Induced Free Electron and Hole Recombination in Semimetallic  $\text{Al}_x\text{Ga}_{1-x}\text{Sb}/\text{InAs}$  Quantum Wells"

Ikai Lo, W.C. Mitchel, and J.-P. Cheng

Phys. Rev. B 48, 9118 (1993)

"The Wannier-Stark Quantization by Internal Field in the  $\text{HgTe}/\text{CdTe}$  Superlattice"

Ikai Lo, W.C. Mitchel, K.A. Harris, R.W. Yanka, LmM. Mohnkern, A.R. Reisinger, and T.H. Myers

Appl. Phys. Lett. 62, 1533 (1993)

"MBE Growth Surface Roughening Kinetics of Ge (001) - A Theoretical Study"

R. Venkatasubramanian and D. L. Dorsey

J. Vacuum Sci. & Technol. B 11, 253 (1993)

"Infrared Absorption in Proton- and Deuteron-Implanted Semi-Insulating  $\text{InP:Fe}$ "

D.W. Fischer, M.O. Manasreh, G. Matous, and S.J. Pearton

Semi-insulating III-V Materials, Ixtapa, Mexico 1992, ed. C.J. Miner, W. Ford, and E.R. Wever, Institute of Physics Publ., Philadelphia, p. 259 (1993)

"Enhanced and Persistent Photocurrents in Bulk Semi-insulating GaAs at Low Temperatures"

W.C. Mitchel, Laura S. Rea, and Juan Jiménez

Semi-insulating III-V Materials, Ixtapa, Mexico 1992, ed. C.J. Miner, W. Ford, and E.R. Wever, Institute of Physics Publ., Philadelphia, p. 229 (1993)

"A Theoretical Study of Amorphous-Crystalline Transition in Si [111] MBE Growth"

R. Venkatasubramanian, D. L. Dorsey and S. G. Das

Evolution of Surface and Thin Film Microstructure, ed. H.A. Atwater, E. Chason, M. Grabow and M. Lagally  
MRS Symposium Proceedings Series 280 (1993)

"A Fully Automated Stage for Loss Measurements of Optical Waveguides"

E.T. Kensky and D.E. Zelmon

Rev. Sci. Instru. 64, 1794 (1993)

"Surface Ordering Kinetics of MBE Grown  $\text{Ga}_{0.5}\text{Al}_{0.5}\text{As}$  - A Theoretical Study"

R. Trivedi, R. Venkatasubramanian, D.L. Dorsey and S. Krishnamurthy  
Common Themes and Mechanisms of Epitaxial Growth, ed. P. Fuoss, D.W. Kisker, J. Tsao, A. Zangwill and T.F. Kuech  
MRS Symposium Proceedings Series 312 (1993)

"Deep Level Transient Spectroscopy and Admittance Spectroscopy of  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}$  Grown by Gas Source Molecular Beam Epitaxy"

S. H. Li, S. R. Smith, P. K. Bhattacharya, S.W. Chung, and W. C. Mitchel  
J. Vac. Sci. Technol. B 11, 892 (1993)

"Nonlinear Optical Characteristics of Binary Organic Systems"

N.B. Singh, T. Henningsen, R.H. Hopkins, R. Mazelsky, R.D. Hamacher, E.Pl Supertzi, F.K. Hopkins, D.E. Zelmon, and O.P. Singh  
J. Cryst. Growth 128, 976 (1993)

" $\text{ZnGeP}_2$  Grown by the Liquid Encapsulated Czochralski Method"

H.M. Hobgood, T. Henningsen, R.N. Thomas, R.H. Hopkins, M.C. Ohmer, W.C. Mitchel, D.W. Fischer, S.M. Hegde, and F.K. Hopkins  
J. Appl. Physics 73, 4030 (1993)

"Photoluminescence Study of Liquid Phase Electroepitaxially Grown  $\text{GaInAsSb}$  on (100)  $\text{GaSb}$ "

S. Iyer, S. Hegde, K.K. Bajaj, Ali Abul-Fadl, and W.C. Mitchel  
J. Appl. Phys. 73, 3958 (1993)

"Growth and Photoluminescence of  $\text{GaSb}$  and  $\text{Ga}_{1-x}\text{In}_x\text{As}_y\text{Sb}_{1-y}$  Grown on  $\text{GaSb}$  Substrates by Liquid Phase Electroepitaxy"

S. Iyer, S. Hegde, Ali Abul-Fadl, K. K. Bajaj and W. Mitchel  
Phys. Rev.B 47, 1329 (1993)

"Isochronal Annealing of Local Vibrational Modes in Proton- and Deuteron-Implanted  $\text{InP}$ "

D.W. Fischer, M.O. Manasreh, D.N. Talwar, and G. Matous  
J. Appl. Phys. 73, 78 (1993)

"Annealing of Pressure-Induced Structural Damage in Superconducting  $\text{Bi-Pb-Sr-Ca-Cu-O}$  Ceramic"

I. Maartense and A.K. Sarkar  
J. Mater. Res. 8, 2177 (1993)

"Deep Levels in Undoped  $\text{Si}_{1-x}\text{Ge}_x$  Grown by Gas-Source Molecular Beam Epitaxy"

S.H. Li, P.K. Bhattacharya, S.W. Chung, S. R. Smith, and W.C. Mitchel  
J. Electronic Mat. 22, 151 (1993)

"Optical Anisotropy of Polymeric Films Measured by Waveguide Propagation Mode Determination"

S.J. Bai, R.J. Spry, D.E. Zelmon, U. Ramabadran, and J. Jackson  
J. of Polymer Sci.: B: Phys. Sec. 30, 1507 (1992)

"A Shubnikov-de Haas Study in the Strained  $\text{Al}_{0.6}\text{Ga}_{0.4}\text{Sb}/\text{InAs}/\text{Al}_{0.6}\text{Ga}_{0.4}\text{Sb}$  Quantum Wells"

Ikai Lo, W.C. Mitchel, M.O. Manasreh, C.E. Stutz, and K.R. Evans  
Fifteenth State-of-the-Art Program on Compound Semiconductors (SOTAPOCS XV), ed. A. Katz, V. Swaminathan, N. Buckley, P. Clechet, and O. Ueda, Vol. 92-19, 162, The Electrochem. Soc., NJ (1992)

"Intersubband Transitions in  $\text{In}_{0.07}\text{Ga}_{0.93}\text{As}/\text{Al}_{0.4}\text{Ga}_{0.6}\text{As}$  Multiple Quantum Wells"

F. Szmulowicz, M. O. Manasreh, C. Kutsche, and C. E. Stutz  
Infrared Detectors-Materials, Processing, and Devices, ed. A. Applebaum and L. R. Dawson, MRS Symposium Series 299 (1993)

"Effects of Two-photon Absorption on Degenerate Four-wave Mixing in Solutions of Diphenyl Polyenes"

P.A. Fleitz, R.L. Sutherland, L.V. Natarajan, T. Pottenger, and N.C. Fernelius  
Optics Lett. 17, 716 (1992)

"Calculation and Measurement of the Electron Density and Temperature Dependence of the Intersubband Absorption in n-type GaAs/Al<sub>0.3</sub>Ga<sub>0.7</sub>As Quantum Well"

F. Szmulowicz, T. Vaughan, M. O. Manasreh and C. E. Stutz

21st International Conference on the Physics of Semiconductors (Beijing, China August 1992) ed. Ping Jiang and Hou-Zhi Zheng, Vol.1, 733, World Scientifics, New Jersey (1992)

Book Review of Contemporary Nonlinear Optics, ed. G.P. Agrawal and R.O. Boyd, Academic Press (1992)

F.K. Hopkins

Optical Engineering 32, 642 (1993)

"Dark Current Analysis of InSb Photodiodes" by F.K. Hopkins and J.T. Boyd, 1984.

Selected as one of "74 Significant Articles" from the international infrared literature for inclusion in Selected Papers on Semiconductor Infrared Detectors, Ed. A. Rogalski  
Milestone Series MS66, SPIE, Bellingham, WA (1992)

"Optical Waveguides Fabricated by Ion-implantation of Si<sup>+</sup> and N<sup>+</sup> in SiO<sub>2</sub> : A Raman Investigation"

U. B. Ramabadran, H. E. Jackson and J. T. Boyd

Appl. Optics 32, 1993

"Thin upper-confining layer Al<sub>x</sub>Ga<sub>1-x</sub>As-GaAs quantum well heterostructure"

S.J. Caracci, F.A. Kish, M.R. Krames, M.J. Ries, and N. Holonyak, Jr.

Appl. Phys. Lett. 62, 1006 (1993)

"Planer single-facet teardrop-shaped Al<sub>x</sub>Ga<sub>1-x</sub>As-GaAs quantum well heterostructure laser"

S.J. Caracci, M.R. Krames, M.J. Ries, and N. Holonyak, Jr.

Appl. Phys. Lett. 63, 1818 (1993)

### 6.3 Accepted for Publication

"Hydrogen-iron Interaction in Proton-implanted InP:Fe"

D.W. Fischer, M.O. Manasreh, and G. Matous

Appl. Phys. Lett.

"Calculation of Giant Third-order Nonlinear Susceptibilities due to Excitonic Processes in Rectangular GaAs Quantum Well Wires"

F.L. Madarasz, Frank Szmulowicz, F.K. Hopkins, and D.L. Dorsey

J. Appl. Phys.

"Native-Oxide-Defined Low-Loss AlGaAs-GaAs Planar Waveguide Bends"

S.J. Caracci, M.R. Krames, N. Holonyak, Jr., C.M. Herzinger, A.C. Crook, T.Z. DeTemple, and P.-A. Besse

Appl. Phys. Lett.

"Determination of the Valence Band Discontinuity in Be-doped GaAs/Al<sub>0.3</sub>Ga<sub>0.7</sub>As Multiple Quantum Wells using Admittance Spectroscopy"

S.R. Smith, F. Szmulowicz, and G.J. Brown

J. Appl. Phys.

"The negative persistent phototconductivity in the deep quantum wells"

Ikai Lo, W.C. Mitchel, C.E. Stutz and M.Y. Yen

Proc. MRS Symposium on semiconductor heterostructures for photonic and electronic applications (1993)

"Observation of Surface Defects in 6H-SiC Wafers"

A.O. Evwaraye, S.R. Smith, M. Skowronski and W.C. Mitchel

J. Appl. Phys.

"Heat Transport Through MBBA due to Induced Electrohydrodynamic Motion"

R.R. Biggers, J. Rish III, and R. Fuller

J. Mol. Crys.-Liq. Crys.

"Raman Investigation of the Nonlinear Optical Phenomenon of Polarization Rotation in  $\text{Ti:LiNbO}_3$  Channel Waveguides"

U. B. Ramabadran, H. E. Jackson, and J. T. Boyd  
J. Appl. Phys.

"Low-temperature PL Characterization of LPEE Grown GaSb and GaInAsSb Layers on GaSb"

S. Iyer, S. Hegde, K. K. Bajaj, A. Abul-Fadl, and W. Mitchel  
MRS Symposium Proceedings, Spring Meeting, San Francisco, April 1993 (in press)

Growth of  $\text{InGaP}_2$  by LP-MOCVD and Characterization of Lattice Ordering"

V. E. Stenger, P. B. Kosel, S. M. Hegde, and M. C. Ohmer  
Proceedings of the State of the Art Program on Compound Semiconductors (SOTAPOCS XVIII) held at the 183rd Meeting of the Electrochemical Society, Honolulu, Hawaii, May 1993.

#### 6.4 Submitted for Publication

"An Improved Method for Measuring Relative Permittivity versus Temperature and Frequency of Dielectric Materials"

E. T. Kensky and A.L. McPherson  
Rev. Sci. Instru.

"Electron Paramagnetic Resonance Study of a Point Defect in as-Grown  $\text{ZnGeP}_2$ "

M.H. Rakowsky, W.K. Kuhn, W.J. Lauderdale, L.E. Halliburton, G.J. Edwards, M.P. Scripsick, P.G. Schunemann, T.M. Pollack, M.C. Ohmer, and F.K. Hopkins  
J. Appl. Phys.

"Shallow Levels in n-type 6H-Silicon Carbide as Determined by Admittance Spectroscopy"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel  
J. Appl. Phys.

"Electrical Properties of Deep Levels in Bulk n-type Silicon Carbide"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel  
J. Appl. Phys.

"Deposition of SiC from a Laser-Ablated 6H-SiC Target at Room Temperature"

M.A. Capano, P.T. Murray, D. Dempsey, and J.T. Grant  
Proc. International Conf. on SiC and Related Materials-1993, Washington, DC, 1-3 Nov 93

"Atomic Force Microscopy of AlN Thin Films Grown on  $\text{Al}_2\text{O}_3$ "

A.J. Steckl, M.D. Roth, J. Edgar, and Z.J. Yu  
Proc. International Conf. on SiC and Related Materials-1993, Washington, DC, 1-3 Nov 93

"Observation of the Persistent Photo-effect in GaAs/AlGaAs Multiple Quantum Wells"

D. Donnelly, J. Schauer, M.O. Manasreh, C.E. Stutz, and F. Szmulowicz  
Proc. 17th Internat. Conf. on Defects in Semiconductors (ICDS-17), Gmunden, Austria, Jul 93

"High Volume Restrictions on Thermodynamic Equations of State"

Robert Nelson and J. Seal  
Am. Instit. of Chem. Engineers

"Optical Clarity and Waveguide Performance of Thin Film Perovskites on  $\text{MgO}$ "

F.J. Walker, R.A. McKee, Huan-wun Yen, and D.E. Zelmon  
Appl. Phys. Lett.

"Ion Implantation Damage and Annealing in GaSb"

S. Iyer, R. Parakkat, B. Patnaik, N. Parikh, and S. Hegde  
MRS Symposium Proceedings, Fall 1993 meeting

"Optical Properties of Deuterated Zinc Tris Thiourea Sulphate"

U.B. Ramabadran, A.L. McPherson, and D.E. Zelmon  
J. Appl. Phys.

"Additional H-related Local Vibrational Modes in Proton-implanted InP"  
D.W. Fischer, M.O. Manasreh, and G. Matous  
J. Appl. Phys.

"Photocurrent Transients in Semi-Insulating GaAs, Effects of EL2 and other Defects"  
W.C. Mitchel and J. Jiménez  
J. Appl. Phys.

"Prediction of Giant  $\chi^{(3)}$  Values from a Calculation of Excitonic Nonlinear Optical Properties in Rectangular GaAs Quantum Well Wires"  
F.L. Madarasz, Frank Szmulowicz, F.K. Hopkins, and D.L. Dorsey  
Phys. Rev. B

## 6.5 Presentations

(Invited) "Development of GaInP/GaAs Quantum Wells for Infrared Detector Applications"  
G.J. Brown  
Workshop on Future Trends of Quantum Structures and Device Applications, Evanston, IL, June 1993

(Invited) "Optical Quantum Well Modeling"  
F. Szmulowicz  
Quantum Device Engineering Workshop, Cincinnati, OH, 13-15 Sep 1993

"DLTS and Admittance Spectroscopy of  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}$  Grown by Gas Source Molecular Beam Epitaxy"  
S. H. Li, P. K. Bhattacharya, S. R. Smith and W. C. Mitchel  
Twelfth North American Conf. on MBE, Toronto, Canada, 12-14 October 92

"Role of Liquid in Improving the Superconductive Properties of the Ag/Bi(Pb)-Sr-Ca-Cu-O System"  
Asok K. Sarkar, I. Maartense, and T. L. Peterson  
MRS Fall Meeting, Boston MA, November 1992

"A Theoretical Study of Amorphous-Crystalline Transition in Si [111] MBE Growth"  
R. Venkatasubramanian, D. L. Dorsey, and S.G. Das  
MRS Fall Meeting, Boston, MA, November 1992

"The negative persistent phototconductivity in the deep quantum wells"  
Ikai Lo, W.C. Mitchel, C.E. Stutz and M.Y. Yen  
Symposium on semiconductor heterostructures for photonic and electronic applications, MRS Fall Meeting, Boston, MA, November 1992

"Multiple Magnetic Transitions Near  $T_c$  in YBCO (123+211) Crystals Prepared by Melt-Texturing"  
I. Maartenese, G. Kozlowski, and T.L. Peterson  
MRS Fall Mtg., Boston, MA, November, 1992

"The Wannier-Stark Quantization by Internal Field in the HgTe/CdTe Superlattice"  
Ikai Lo, W.C. Mitchel, T.H. Myers, and K.A. Harris  
Am. Phys. Soc. March Mtg., Seattle, WA, March 1993.

"Luminescence Spectroscopy of Zinc Germanium Phosphide"  
M.R. Gregg, P.H. Ostdiek, R.L. Hengehold, Y.K. Yeo, M.C. Ohmer, S.M. Hegde, and P.G. Shunemann  
Bull. APS 38, 686, abs.O19-1 (1993)

"Growth and Photoluminescence of GaSb and  $\text{As}_{1-x}\text{In}_x\text{As}_y\text{Sb}_{1-y}$  Grown on GaSb Substrates by Liquid-Phase Electroepitaxy"  
S. Iyer, A.A. Gadl, S. Hegde, K.K. Bajaj, and W.C. Mitchel  
Bull. APS 38, 686, abs.O19-2 (1993)

## FY94 Amendment, WUD#48 "Electronic & Optical Materials"

"A Shubnikov-de Haas Study of Tilted Magnetic Field in the HgTe/CdTe Superlattice"  
Ikai Lo, W.C. Mitchel, and D. Boeringer  
Spring MRS Mtg., San Francisco, CA, April 1993.

"Growth and Characterization of 3-methoxy 4-hydroxy benzaldehyde"  
Uma B. Ramabadran and David E. Zelmon  
MRS Spring Meeting, San Francisco, CA, April 1993.

"Interferometric measurement of the piezoelectric coefficients of triallyl thiourea cadmium chloride crystals"  
Uma B. Ramabadran, David E. Zelmon and Gretchen C. Kennedy  
MRS Spring Meeting, San Francisco, CA, April 1993.

"Surface Ordering Kinetics of MBE Grown  $\text{Ga}_{0.5}\text{Al}_{0.5}\text{As}$  - A Theoretical Study"  
R. Trivedi, R. Venkatasubramanian, D.L. Dorsey, and S. Krishnamurthy  
Spring MRS Mtg., San Francisco, CA, April 1993.

Intersubband Transitions in  $\text{In}_{0.07}\text{Ga}_{0.93}\text{As}/\text{Al}_{0.4}\text{Ga}_{0.6}\text{As}$  Multiple Quantum Wells  
F. Szmulowicz, M. O. Manasreh, C. Kutsche, and C. E. Stutz  
Materials Research Society Spring Mtg., San Francisco, April 1993.

"Low-temperature PL Characterization of LPEE Grown GaSb and GaInAsSb Layers on GaSb"  
S. Iyer, S. Hegde, K. K. Bajaj, A. Abul-Fadl, and W. Mitchel  
MRS Spring Meeting, San Francisco, April 1993.

"Growth of  $\text{InGaP}_2$  by LP-MOCVD and Characterization of Lattice Ordering"  
V. E. Stenger, P. B. Kosel, S. M. Hegde, and M. C. Ohmer  
State of the Art Program on Compound Semiconductors (SOTAPOCS XVIII) held at the 183rd Meeting of the Electrochemical Society, Honolulu, Hawaii, May 1993.

"Nonlinear Optical Materials: The Air Force Laboratory Programs"  
F.K. Hopkins and M.N. Alexander  
AGED STAR on Nonlinear Optical Materials, Washington DC, 21-22 July 1993

"Observation of the Persistent Photo-effect in GaAs/AlGaAs Multiple Quantum Wells"  
D. Donnelly, J. Schauer, M.O. Manasreh, C.E. Stutz, and F. Szmulowicz  
17th International Conf. on Defects in Semiconductors (ICDS-17), Gmunden, Austria, 18-23 Jul 93

"Magnetic Resonance of  $\text{ZnGeP}_2$ : Defect Centers in an Optical Parametric Oscillator"  
M.K. Rakowsky, W.K. Kuhn, R.A. Mantz, P.J. Drevinsky, M.C. Ohmer, D.F. Bliss, P.G. Schunemann, and T.M. Pollack  
35th Rocky Mountain Conf. on Analytical Chemistry, Denver, CO, 25-29 Jul 1993

"The Role of Platinum in Melt-Processed  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  Superconductor with  $\text{Y}_2\text{BaCu}_3\text{O}_5$  Inclusions"  
G. Kozlowski, C.E. Oberly, I. Maartense, and W. Endres  
Int Cryogenic Materials Conference, Albuquerque NM, July 1993

### 6.6 Submitted/Accepted for Presentation in FY94

"Phase Matching Characterization and Crystal Growth of 4-hydroxy, 3-methoxy benzaldehyde"  
Uma B. Ramabadran, Rama Vuppuladhadi and David E. Zelmon  
Optical Society of America Meeting, Toronto, 3-9 October 1993

"Photoresponse Study of Normal Incidence Detection in p-type GaAs/AlGaAs Multiple Quantum Wells"  
G.J. Brown and F. Szmulowicz  
The 1993 U.S. Workshop on the Physics and Chemistry of HgCdTe and other IR Materials, Seattle, WA, 19-21 Oct 1993

"Impurity-related Absorption Bands in Bulk Silicon Carbide Crystals"  
M. Shah, W.C. Mitchel, and J. Solomon  
International Conf. on SiC and Related Materials-1993, Washington, DC, 1-3 Nov 93

"Deposition of SiC from a Laser-Ablated 6H-SiC Target at Room Temperature"

M.A. Capano, P.T. Murray, D. Dempsey, and J.T. Grant

International Conf. on SiC and Related Materials-1993, Washington, DC, 1-3 Nov 93

"Atomic Force Microscopy of AlN Thin Films Grown on Al<sub>2</sub>O<sub>3</sub>"

A.J. Steckl, M.D. Roth, J. Edgar, and Z.J. Yu

International Conf. on SiC and Related Materials-1993, Washington, DC, 1-3 Nov 93

"Characterization of Defects in n-type 6H-SiC Single Crystals by Optical Admittance Spectroscopy"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel

Fall MRS Mtg., Boston, MA, November 1993.

"Temperature and Polarization Dependence of the Optical Absorption in ZnGeP<sub>2</sub> at Two Microns"

M. Shah, D.W. Fischer, M.C. Ohmer, M.O. Manasreh, P.G. Schunemann, and T.M. Pollack

Fall MRS Mtg., Boston, MA, November 1993.

"Optical Absorption of Transition Metal Impurities in 6H-SiC Single Crystals"

J. Jenny, M. Skowronski, M. Shah, and J. Solomon

Fall MRS Mtg., Boston, MA, November 1993.

"Anomalous Behavior of DX Centers in Compositionally Graded GaAs/Al<sub>x</sub>Ga<sub>1-x</sub>As:Si Heterojunctions"

S.R. Smith and A.O. Evwaraye

Fall MRS Mtg., Boston, MA, November 1993.

"Stability of Sulfide Passivated Gallium Arsenide Surfaces"

J.S. Solomon, L. Petry, and S.R. Smith

Fall MRS Mtg., Boston, MA, November 1993.

"A Sapphire Resonator Technique for Measuring the Complex Surface Impedance versus Temperature of HTS Thin Films"

R. R. Fletcher, J.A. Cook, and R.R. Biggers

Fall MRS Mtg., Boston, MA, November 1993.

"A Study of Magnetic-Field-Induced Semimetal to Semiconductor Transition in Al<sub>x</sub>Ga<sub>1-x</sub>Sb/InAs Quantum Well"

Ikai Lo, W.C. Mitchel, and J.-P. Cheng

Fall MRS Mtg., Boston, MA, November 1993.

(Invited) "Deep Level Defects, Luminescence, and the Electro-Optic Properties of SiGe/Se Heterostructures"

Pallab Bhattacharya, Shin Hwa Li, and Steve Smith

Fall MRS Mtg., Boston, MA, November 1993.

"Striking Differences in the Properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films, Grown Side-by-side by PLD at Power Densities of ~10<sup>9</sup> W/cm<sup>2</sup>"

R.R. Biggers, I. Maartense, T.L. Peterson, R. Fletcher, D. Dempsey and M.G. Norton

Spring MRS Mtg., Symposium S: High-Temperature Superconductors-Multilayers, Interfaces, and Applications, San Francisco, CA, April 1994

"Examination of Particles and Outgrowths on the Surface of Epitaxial YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films"

M.G. Norton, R.R. Biggers, I. Maartense and J.L. Brown

Spring MRS Mtg., Symposium F: Epitaxial Oxide Thin Films and Heterostructures, San Francisco, CA, April 1994

## 6.0 FY94 PATENTS, SCIENTIFIC PUBLICATIONS, & PRESENTATIONS

### 6.1 Patents

"Laminated Upper Cladding Structure For A Light Emitting Device"

Mike Ludowise, Nick Holonyak Jr., Steve Caracci, Michael Krames, Fred Kish  
Number 08/193,681

"Semiconductor Devices and Techniques For Controlled Optical Confinement"

Nick Holonyak Jr., Fred Kish, Steve Caracci  
Number 5,327,448, Issued July 5, 1994

"Multi-System Laser Safety Shutter Controller"

E. Thomas Kensky (AF Invention 19915)  
Number 5,301,347, Issued 5 Apr 94

"Optical Modulation and Switching with Enhanced Third-Order Nonlinearity Multiple Quantum Well Effects" (AF Invention 19654)

F.K. Hopkins, J.T. Boyd, and H.E. Jackson  
Number 5,274,246, Issued 28 Dec 1993

"Transparent Semiconductor Crystals"

M.C. Ohmer (AF Invention 20180)  
Number 5,259,917, Issued 9 Nov 93

### 6.2 FY94 PUBLICATIONS

#### 6.2.1 Published Book:

Technologies For Optical Fiber Communications, Ed. by Gail J. Brown, Didier J. Decoster, Joanne S. LaCourse, Yoon S. Park, Kenneth D. Pedrotti, Susan R. Sloan  
SPIE Proceedings 2149 (1994)

#### 6.2.2 Published in Refereed Journals:

"Interface roughness scattering in thin, undoped GaInP/GaAs quantum wells,"

W. C. Mitchel, G. J. Brown, I. Lo, S. Elhamri, M. Ahoujja, K. Ravindran, R. S. Newrock, M. Razeghi, and X. He  
Appl. Phys. Lett. 65, 1578 (1994)

"Electronic properties of  $\text{Al}_x\text{Ga}_{1-x}\text{Sb}/\text{InAs}$  quantum wells"

I. Lo, W. C. Mitchel, and J.-P. Cheng  
Phys. Rev. B 50, 5316 (1994)

"Intersubband hole absorption in GaAs-GaInP quantum wells grown by gas source molecular beam epitaxy"

G. J. Brown, S. M. Hegde, J. Hoff, C. Jelen, S. Slivken, E. Michel, O. Duchemin, E. Bigan, and M. Razeghi  
Appl. Phys. Lett. 65, 1130 (1994).

"Observation of a negative persistent photoconductivity effect in InGaSb/InAs quantum wells,"

I. Lo, W. C. Mitchel, R. Kaspi, S. Elhamri, and R. S. Newrock  
Appl. Phys. Lett. 65, 1024 (1994)

- "Negative Persistent Photoeffect on Cyclotron Resonance in InAs/AlGaSb Quantum Wells," J.-P. Cheng, I. Lo, and W. C. Mitchel  
J. Appl. Phys. **76**, 667 (1994).
- "Long wavelength native-oxide-defined InAlAs-InP-InGaAsP quantum well heterostructure laser diodes"  
S. J. Caracci, M. R. Krames, N. Holonyak Jr., M. J. Ludowise and A. Fischer-Colbrie  
J. Appl. Phys. **75**, 2706 (1994)
- "Polarized luminescence study of ordered nonlinear optical material ZnGeP<sub>2</sub>"  
J. E. McCrae, Jr., M. R. Gregg, R. L. Hengehold, Y. K. Yeo, and P. H. Ostdiek, M. C. Ohmer, P. G. Schunemann and T. M. Pollak  
Appl. Phys. Lett. **64**, 3142 (1994).
- "Optical Clarity and Waveguide Performance of Thin Film Perovskites on MgO"  
F.J. Walker, R.A. McKee, Huan-wun Yen, and D.E. Zelmon  
Appl. Phys. Lett. **65**, 1495 (1994)
- "Optical Properties of deuterated Zinc Tris Thiourea Sulphate"  
Ramabadran, Uma B., Angela L. McPherson, and David E. Zelmon,  
J. Appl. Phys. **76**, 1150 (1994)
- "Microwave properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> films at 35 GHz from magnetotransmission and magnetoreflexion measurements,"  
E. K. Moser, W. J. Tomasch, M. J. McClorey, J. K. Furdyna, M. W. Coffey, C. L. Pettiette-Hall and S. M. Schwarzbek,  
Physical Review B **49**, 4199 (1994)
- "Photocurrent Transients in Semi-Insulating GaAs, Effects of EL2 and other Defects"  
W.C. Mitchel and J. Jiménez  
J. Appl. Phys. **75**, 3060 (1994)
- "Electron Paramagnetic Resonance Study of a Native Acceptor in as-Grown ZnGeP<sub>2</sub>"  
M.H. Rakowsky, W.K. Kuhn, W.J. Lauderdale, L.E. Halliburton, G.J. Edwards, M.P. Scripsick, P.G. Schunemann, T.M. Pollack, M.C. Ohmer, and F.K. Hopkins  
Appl. Phys. Lett. **64**, 1615 (1994)
- "Shallow Levels in n-type 6H-Silicon Carbide as Determined by Admittance Spectroscopy"  
A.O. Ewvaraye, S.R. Smith, and W.C. Mitchel  
J. Appl. Phys. **75**, 3472 (1994)
- "Additional H-related Local Vibrational Modes in Proton-implanted InP"  
D.W. Fischer, M.O. Manasreh, and G. Matous  
Semicond. Sci. Technol. **9**, 1 (1994)
- "Calculation of Giant Third-order Nonlinear Susceptibilities due to Excitonic Processes in Rectangular GaAs Quantum Well Wires"  
F.L. Madarasz, Frank Szmulowicz, F.K. Hopkins, and D.L. Dorsey  
J. Appl. Phys. **75**, 639 (1994)
- "Observation of Surface Defects in 6H-SiC Wafers"  
A.O. Ewvaraye, S.R. Smith, M. Skowronski and W.C. Mitchel  
J. Appl. Phys. **74**, 5269 (1993)
- "Native-Oxide-Defined Low-Loss AlGaAs-GaAs Planar Waveguide Bends"  
S.J. Caracci, M.R. Krames, N. Holonyak, Jr., C.M. Herzinger, A.C. Crook, T.Z. DeTemple, and P.-A. Besse  
Appl. Phys. Lett. **63**, 2265 (1993)
- "Heat Transport Through MBBA due to Induced Electrohydrodynamic Motion"  
R.R. Biggers, J. Rish III, and R. Fuller  
J. Mol. Crys. Liq. Crys. **237**, 351 (1994)
- "Hydrogen-iron Interaction in Proton-implanted InP:Fe"  
D.W. Fischer, M.O. Manasreh, and G. Matous  
Appl. Phys. Lett. **63**, 3038 (1993)

"Determination of the Valence Band Discontinuity in Be-doped GaAs/Al<sub>0.3</sub>Ga<sub>0.7</sub>As Multiple Quantum Wells using Admittance Spectroscopy"  
S.R. Smith, F. Szmulowicz, and G.J. Brown  
J. Appl. Phys. **72**, 1010 (1994)

"Prediction of Giant  $\chi^{(3)}$  Values from a Calculation of Excitonic Nonlinear Optical Properties in Rectangular GaAs Quantum Well Wires"  
F.L. Madarasz, Frank Szmulowicz, F.K. Hopkins, and D.L. Dorsey  
Phys. Rev. B **49**, 13528 (1994)

"Raman Investigation of the Nonlinear Optical Phenomenon of Polarization Rotation in Ti:LiNbO<sub>3</sub> Channel Waveguides"  
U. B. Ramabadran, H. E. Jackson, and J. T. Boyd  
J. Appl. Phys. **74**, 1492 (1993)

"Measurement of Surface Impedance versus Temperature using a Generalized Sapphire Resonator Technique"  
R. Fletcher and J. Cook  
Rev. Sci. Instru. **65**, 2658 (1994)

"Growth of binary organic NLO crystals: m.Na-p.NA and m.Na-CNA systems"  
T. Henningsen, N.B. Singh, R.H. Hopkins R. Mazelsky, F.K. Hopkins, D.O. Frazier, and O.P. Singh  
Materials Letters **20**, 203 (1994)

### 6.2.3 Published in Refereed Conference Proceedings:

"Deposition of SiC from a Laser-Ablated 6H-SiC Target at Room Temperature"  
M.A. Capano, P.T. Murray, D. Dempsey, and J.T. Grant  
Silicon Carbide and Related Materials, eds. M.G. Spencer, et al., Inst. of Phys. Conf. Series **137**, 91 (1994)

"Atomic Force Microscopy of AlN Thin Films Grown on Al<sub>2</sub>O<sub>3</sub>"  
A.J. Steckl, M.D. Roth, J. Edgar, and Z.J. Yu  
Silicon Carbide and Related Materials, eds. M.G. "Spencer, et al., Inst. of Phys. Conf. Series **137**, 555 (1994)

"Electron and Scanning Probe Microscopies in the Study of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Film Growth"  
M. G. Norton, R.R. Biggers, I. Maartense, E.K. Moser, and J.L. Brown  
Proc. 52nd Ann. Mtg. Microscopy Soc. of America (1994)

"Deep Level Defects, Luminescence, and the Electro-Optic Properties of SiGe/Si Heterostructures"  
Pallab Bhattacharya, Shin-Hua Li, Jinju Lee, and Steve Smith  
Invited Talk Fall Meeting of the Materials Res. Soc. 1993  
Material Res. Soc. Symposium Proceedings **325**, 147 (1994)

"Characterization of Defects in n-type 6H-SiC Single Crystals by Optical Admittance Spectroscopy"  
A.O. Evwaraye, S.R. Smith, and W.C. Mitchel  
Mater. Res. Soc. Symposium Proc. **325**, 353 (1994)

"Stability of Sulfide Passivated Gallium Arsenide Surfaces"  
J.S. Solomon, L. Petry, and S. R. Smith  
Materials Res. Soc Symposium Proceedings **318**, 237 (1994)

"MBE Doping Kinetics - A Rate Equation Study"  
S. Bendi, R. Venkatasubramanian and D.L. Dorsey  
Mechanisms of Thin Film Evolution, edited by S.M. Yalisove, C.V. Thompson and D.J. Eaglesham  
MRS Symposium Series **317**, 387 (1994)

"A Monte Carlo Model of GaAs (111)B Epitaxy"  
D.L. Dorsey, R. Venkatasubramanian, M.Y. Yen and T.W. Haas  
Compound Semiconductor Epitaxy, edited by C.W. Tu, L.A. Kolodziejski and V.R. McCrary  
MRS Symposium Proceedings Series **340**, 41 (1994)

"Low-temperature PL Characterization of LPEE Grown GaSb and GaInAsSb Layers on GaSb"  
S. Iyer, S. Hegde, K. K. Bajaj, A. Abul-Fadl, and W. Mitchel  
Matls. Res. Soc. Symp. Proc. **299**, 41 (1994)

"Ion Implantation Damage and Annealing in GaSb"  
S. Iyer, R. Parakkat, B. Patnaik, N. Parikh, and S. Hegde  
Matls. Res. Soc. Symp. Proc. **316**, 185 (1994)

"Temperature and polarization dependence of the optical absorption in  $\text{ZnGeP}_2$  at two micrometers"  
M. Shah, M.C. Ohmer, D.W. Fischer, N.C. Fernelius, M.O. Manasreh, P.G. Schunemann, and T.M. Pollak  
Defects in Advanced Semiconductors: Physics and Applications ed. M.O. Manasreh, H.J. von Bardeleben, G.S. Pomrenke, M. Lannoo, & D.H. Talwar  
MRS Sympos. Proceedings 325, 463 (1994)

"Anomalous Behavior of DX Centers in Compositionally Graded  $\text{GaAs}/\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{Si}$  Heterojunctions"  
S.R. Smith and A.O. Evwaraye  
Mat. Res. Soc. Symp. Proc. 326, 193 (1994)

#### 6.2.4 Non-Refereed Publications:

"Tech Transfer and the Federal Labs"  
F. Kenneth Hopkins  
Optics and Photonics News 4, 2 (1993)

"Tech Transfer"  
F. K. Hopkins and P.M. Hemenger  
Mini-Conductor 27, 4 (1994)

"Properties and Bibliography of GaSe"  
Nils C. Fernelius  
WL-TR-94-4013, February 1994

#### 6.3 ACCEPTED FOR PUBLICATION

(Invited Review Article in upcoming book)  
"Normal Incidence Detection of Infrared Radiation in P-type  $\text{GaAs}/\text{AlGaAs}$  Quantum Well Structures"  
G. J. Brown and F. Szmulowicz  
Semiconductor Quantum Wells and Superlattices for Long-Wavelength Infrared Detectors,  
Gordon Breach, Vol. I in the new Electro-optical Properties Series.

"Temperature and Many Body Effects on the Intersubband Transition in a  $\text{GaAs}/\text{Al}_{0.3}\text{Ga}_{0.7}\text{As}$  Multiple Quantum Well"  
F. Szmulowicz, M.O. Manasreh, C.E. Stutz, and T. Vaughan  
Phys. Rev. B (15 October 94)

"Temperature Dependence of Photoluminescence Line Width in Modulation Doped Pseudomorphic High Electron Mobility Transistor  $\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{In}_y\text{Ga}_{1-y}\text{As}/\text{GaAs}$  Structures"  
P.W. Yu, B. Jogai, T.J. Rogers, P.A. Martin, and J.M. Ballingall  
Appl. Phys. Lett. (December 1994)

"YBCO Film Growth on Ultra-Thin Ag Layers"  
C. Zhong, S.T. Ruggiero, and R. Fletcher  
J. of Matls. Res. 9 (November 1994)

"MBE Doping Kinetics - A Rate Equation Model"  
S. Bendi, R. Venkatasubramanian and D.L. Dorsey  
J. Appl. Phys.

"Examination of electrical and optical properties of vanadium in bulk n-type silicon carbide"  
A O. Evwaraye, S. R. Smith and W. C. Mitchel  
J. Appl. Phys. (15 Nov 94)

"Properties and Bibliography of GaSe"  
Nils C. Fernelius  
Progress in Crystal Growth and Characterization of Materials

"Surface Outgrowths on Laser-Deposited  $\text{YBa}_2\text{Cu}_3\text{O}_7$  Thin Films"  
M. Grant Norton, Rand R. Biggers, Iman Maartense, E. K. Moser, and Jeff L. Brown  
Physica C

"Photoresponse Study of Normal Incidence Detection in P-Type  $\text{GaAs}/\text{AlGaAs}$  MQWs"  
G.J. Brown, F. Szmulowicz, and S.M. Hegde  
Proc. Mercury-Cadmium-Telluride Conf. (Oct 93)  
Journal of Electr. Mat. (1994, in print).

"Semi-empirical SCF Study of Surface Atom Energetics in Semiconductors: Si and GaAs"

S.G. Das and D.L. Dorsey

Int. J. of Computational Methods

Growth of InGaP<sub>2</sub> by LP-MOCVD and Characterization of Lattice Ordering"

V. E. Stenger, P. B. Kosel, S. M. Hegde, and M. C. Ohmer

Proceedings of the State of the Art Program on Compound Semiconductors (SOTAPOCS XVIII) held at the 183rd Meeting of the Electrochemical Society, Honolulu, Hawaii, May 1993.

"Characterization of Deep Defects in n-type 6H-SiC Single Crystals by Optical Admittance Spectroscopy"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel

Mater. Res. Soc. Symp. Proc. (1994 Spring Mtg.)

Deep Levels in Undoped Bulk 6H-SiC and Associated Impurities: Application of Optical Admittance Spectroscopy.

W.C. Mitchel, Matthew Roth, S.R. Smith, A.O. Evwaraye, and J. Solomon

Proc. 21st Internat'l Conf. on Compound Semiconductors (Sept 94)

"Computational Methods for Modeling Semiconductor Thin-Film Epitaxy"

D.L. Dorsey

in Computational Materials Science for Laser Hardened Materials Research (Internal Tech Report)

"New Nonlinear Optical Crystals for Infrared Countermeasures"

F. Kenneth Hopkins & Nils C. Fernelius

Proceedings 1994 IRIS Materials Specialty Group Symposium (Aug 94)

"The negative persistent phototconductivity in the deep quantum wells"

Ikai Lo, W.C. Mitchel, C.E. Stutz and M.Y. Yen

Proc. MRS Symp. semiconductor heterostructures for photonic and electronic applications (1993)

"Examination of Particles and Outgrowths on the Surface of Epitaxial YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films"

M.G. Norton, R.R. Biggers, I. Maartense and J.L. Brown

Symposium F: Epitaxial Oxide Thin Films and Heterostructures, Mat. Res. Soc. Symp. Proc., San Francisco, CA (Apr 1994)

#### 6.4 SUBMITTED FOR PUBLICATION

"General expression for optical transition probabilities within the envelope-function approximation"

Frank Szmulowicz

Letters to JETP

"Calculation of Resonant Absorption and Phototresponse Measurement in p-type GaAs/AlGaAs Quantum Wells"

Frank Szmulowicz and Gail J. Brown

Appl. Phys. Lett.

"GaAs/GaInP p-type Quantum Well Intersubband Photodetectors"

J. Hoff, X. He, M. Erdtmann, S. Slivken, R. Williams, E. Bigan, M. Razeghi, and G.J. Brown

Appl. Phys. Lett.

"Second subband population in  $\delta$ -doped AlInAs/GaInAs heterostructures"

I. Lo, W. C. Mitchel, M. Ahoujja, J.-P. Cheng, and A. Fathimulla,

J. Appl. Phys.

"Vanadium Related near-band-edge Absorption Bands in three SiC polytypes"

J.R. Jenny, M. Skowronski, W.C. Mitchel, and H.M. Hobgood

J. Appl. Phys.

"Persistent photocurrent in thin undoped GaInP/GaAs quantum wells,"

S. Elhamri, M. Ahoujja, K. Ravindran, R. S. Newrock, W. C. Mitchel, G. J. Brown, I. Lo, Manijeh Razeghi, and X. He,

Phys. Rev. B.

"The Physics of Normal Incidence Absorption in p-type GaAs/AsGaAs Quantum Well Infrared Detectors"

G.J. Brown and F. Szmulowicz

Proc. 2nd Intl. Symp. on Long-Wavelength Infrared Detectors: Physics and Applications, 186th Mtg. ElectroChem. Soc., Miami, FL (10-12 Oct 1994)

"In Situ Transmission Electron Microscopy Observations of Twinning in Lanthanum Aluminate"  
M. Grant Norton and Rand R. Biggers  
Scripta Metallurgica et Materialia

"Defects and Anomalous Film Growth at the edge of single Crystal Substrates"  
M. Grant Norton, Rand R. Biggers, and Iman Maartense  
J. of Materials Science Letters

"Excitonic Nonlinear Optical Processes in GaAs Quantum Well Wires"  
R.O. Klepfer, F.L. Madarasz, and F. Szmulowicz  
Phys. Rev. B

"Approximate Methods of Solutions to Nonlinear Wave Equations in a  $\chi^{(2)}$  Medium"  
N.D. Amarasinghe, D.S. Moroi, D.E. Zelmon, and F.K. Hopkins  
J. Opt. Soc. Am., Part B

"Derivation of a General Expression for the Momentum Matrix Elements within the Envelope-Function Approximation"  
F. Szmulowicz  
Phys. Rev. B

"Calculation and Measurement of the Bound-to-Continuum Absorption in a p-type GaAs/AlGaAs Quantum Well"  
Frank Szmulowicz and Gail J. Brown  
Phys. Rev. B

"Observation of the Persistent Photo-effect in GaAs/AlGaAs Multiple Quantum Wells"  
D. Donnelly, J. Schauer, M.O. Manasreh, C.E. Stutz, and F. Szmulowicz  
Proc. 17th Internat. Conf. on Defects in Semiconductors (ICDS-17), Gmunden, Austria (July 1993)

"Direct Measurement of ZnGeP<sub>2</sub> Birefringence from 0.66 to 12.2 $\mu$ m Using Polarized Light Interference"  
D.W. Fischer, M.C. Ohmer, P.G. Schunemann, and T.M. Pollak  
J. Appl. Phys.

"High Volume Restrictions on Thermodynamic Equations of State"  
Robert Nelson and J. Seal  
Am. Instit. of Chem. Engineers

"Microstructure and Properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films Grown on Vicinal LaAlO<sub>3</sub> Substrates"  
R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey, M.A. Capano, J. Talvacchio, J.L. Brown, and J.D. Wolf  
IEEE Trans. on Appl. Supercond.

"Self-Heating Hotspot Effects in HTS Thin Films"  
T.L. Peterson, I. Maartense, and Rand R. Biggers  
IEEE Trans. on Appl. Supercond.

"Transport Properties of YBCO Films on Ultra-Thin Ag Layers"  
C. Zhong, S.T. Ruggiero, R. Fletcher, and E. Moser  
IEEE Trans. on Appl. Supercond.

## 6.5 FY94 PRESENTATIONS

"Phase Matching Characterization and Crystal Growth of 4-hydroxy, 3-methoxy benzaldehyde"  
Uma B. Ramabadran, Rama Vuppaladhadiam and David E. Zelmon  
Optical Society of America Meeting, Toronto (3-9 October 1993)

"Photoresponse Study of Normal Incidence Detection in p-type GaAs/AlGaAs Multiple Quantum Wells"  
G.J. Brown and F. Szmulowicz  
The 1993 U.S. Wkshp on the Phys. and Chem. of HgCdTe and other IR Materials, Seattle, WA (19-21 Oct 1993)

"Deposition of SiC from a Laser-Ablated 6H-SiC Target at Room Temperature"  
M.A. Capano, P.T. Murray, D. Dempsey, and J.T. Grant  
International Conf. on SiC and Related Materials-1993, Washington, DC (1-3 Nov 93)

"Atomic Force Microscopy of AlN Thin Films Grown on Al<sub>2</sub>O<sub>3</sub>"

A.J. Steckl, M.D. Roth, J. Edgar, and Z.J. Yu  
International Conf. on SiC and Related Materials-1993, Washington, DC (1-3 Nov 93)

(Invited)"Air Force Superconductivity Materials Program"

T.L. Peterson  
Navy Consortium for Superconductivity. Newport RI (November 1993)

"Temperature and Polarization Dependence of the Optical Absorption in ZnGeP<sub>2</sub> at Two Microns"

M. Shah, D.W. Fischer, M.C. Ohmer, N.C. Fernelius, M.O. Manasreh, P.G. Schunemann, and T.M. Pollack  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

"MBE Doping Kinetics - A Rate Equation Study"

S. Bendi, R. Venkatasubramanian and D.L. Dorsey  
Fall MRS meeting, Boston, MA (29Nov-3Dec 1993)

"Characterization of Defects in n-type 6H-SiC Single Crystals by Optical Admittance Spectroscopy,"

A. O. Evwaraye, S. R. Smith and W. C. Mitchel  
MRS Fall Meeting, Boston, MA (29Nov-3Dec 1993)

"Anomalous Behavior of DX Centers in Compositionally Graded GaAs/Al<sub>x</sub>Ga<sub>1-x</sub>As:Si Heterojunctions"

S.R. Smith and A.O. Evwaraye  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

"Stability of Sulfide Passivated Gallium Arsenide Surfaces"

J.S. Solomon, L. Petry, and S.R. Smith  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

"A Sapphire Resonator Technique for Measuring the Complex Surface Impedance versus Temperature of HTS Thin Films"

R. R. Fletcher, J.A. Cook, and R.R. Biggers  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

"Ion Implantation Damage and Annealing in GaSb"

S. Iyer, R. Parakkat, B. Patnaik, N. Parikh, and S. Hegde  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

"A Study of Magnetic-Field-Induced Semimetal to Semiconductor Transition in Al<sub>x</sub>Ga<sub>1-x</sub>Sb/InAs Quantum Well"

Ikai Lo, W.C. Mitchel, and J.-P. Cheng  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

(Invited) "Deep Level Defects, Luminescence, and the Electro-Optic Properties of SiGe/Se Heterostructures"

Pallab Bhattacharya, Shin Hwa Li, and Steve Smith  
Fall MRS Mtg., Boston, MA (29Nov-3Dec 1993)

"Highly Energetic and Non-Uniform PLD Plume grows Significantly Different YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Films on Side-By-Side Substrates"

Rand R. Biggers, Iman Maartense, David Demspey, M. Grant Norton, T.L. Peterson and Richard Fletcher  
1994 Gordon Research Conference, Oxnard CA (January 1994)

"Photoconductivity Measurements of GaInP/GaAs Quantum Well Infrared Detector Structures"

G.J. Brown  
Wkshp. on Compound Semiconductor Materials and Devices, San Francisco, CA (20-23 February 1994)

"Silicon Carbide Substrates for High Power Microwave Applications"

W.C. Mitchel  
Wkshp. on Compound Semiconductor Materials and Devices, San Francisco, CA (20-23 February 1994)

(Invited)"Microwave transmission and reflection of the high-temperature superconductor YBaCuO"

E. K. Moser  
Wright State University Colloquium (Feb. 1994)

"Low Temperature PL Characteristics of Te Doped LPEE Grown GaSb and Devices,"

S. Iyer, G. Qiu, L. Small, S. M. Hegde, K. K. Bajaj  
Bull. Am. Phys. Soc. 39, 211 (March 1994)

"Electroluminescence in the Rigid-Rod Polymer (p-phenylenebenzobisthiazole) (PBZT)," J. B. Ferguson, R. J. Spry, A. K. Agrawal, J. W. Lee, S. M. Hegde, S. J. Bai, C. S. Wang  
Bull. Am. Phys. Soc. 39, 99 (March 1994)

"Prediction of Giant  $\chi^{(3)}$  Values from a Calculation of Excitonic Nonlinear Optical Properties in Rectangular GaAs Quantum Well Wires"  
F. L. Madarasz, Frank Szmulowicz, F.K. Hopkins, and D.L. Dorsey  
Bull. Am. Phys. Soc. 39, 145 (March 1994)

"Derivation of a General Expression for the Momentum Matrix Elements Within the Envelope-Function Approximation"  
Frank Szmulowicz  
Bull. Am. Phys. Soc. 39, 145 (March 1994)

"Calculation and Measurement of the Bound-to-Continuum Absorption in a p-type GaAs/AlGaAs Quantum Well"  
Frank Szmulowicz and Gail J. Brown  
Bull. Am. Phys. Soc. 39, 146 (March 1994)

"Oscillations in the Cyclotron Resonance of Semimetallic InAs/ $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$  Single Quantum Wells"  
J. Kono, B.D. McCombe, J.-P. Cheng, I. Lo, W.C. Mitchel  
Bull. Am. Phys. Soc. 39, 676 (March 1994)

"Luminescence Study of the Ordered Nonlinear Optical Semiconductor  $\text{ZnGeP}_2$ "  
J.E. McCrae, R.L. Hengehold, Y.K. Yeo, P.H. Ostdek, M.C. Ohmer, T.G. Schunemann, and T.M. Pollack  
Bull. Am. Phys. Soc. 39, 807 (March 1994)

"Observation of New Far-IR Transition in InAs/AlGaSb Confined Structures"  
J.-P. Cheng, J. Kono, B.D. McCombe, I. Lo, and W.C. Mitchel  
Bull. Am. Phys. Soc. 39, 676 (March 1994)

"Persistent Photocurrent in thin, undoped GaInP/GaAs Quantum Well"  
S. Elhamri, M. Ahouja, R.S. Newrock, W.C. Mitchel, Ikai Lo, M. Razeghi, and X. He  
Bull. Am. Phys. Soc. 39, 749 (March 1994)

(Invited) "Nonlinear Optical Crystals Opportunities"  
Nils C. Fernelius  
Workshop on Materials Research and Development Opportunities in the Former Soviet Union, National Academy of Sciences, Washington, DC (22 March 1994)

"Characterization of Defects in n-type 6H-SiC Single Crystals by Optical Admittance Spectroscopy"  
A.O. Ewvaraye, S.R. Smith, and W.C. Mitchel  
Spring MRS Mtg. San Francisco, CA (Apr 1994)

"Chemical Beam Epitaxy and Laser-Enhanced CBE of GaAs using Tris-dimethylaminoarsenic"  
H. K. Dong, N. Y. Li, C. W. Tu, and W. C. Mitchel  
MRS Spring Meeting, San Fransisco, CA (Apr 1994)

"Striking Differences in the Properties of  $\text{YBa}_2\text{Cu}_3\text{O}_7$  Thin Films, Grown Side-by-side by PLD at Power Densities of  $\sim 10^9 \text{ W/cm}^2$ "  
R.R. Biggers, I. Maartense, D. Dempsey, M.G. Norton, T.L. Peterson, and R. Fletcher  
Spring MRS Mtg., San Francisco, CA (Apr 1994) Symposium S: High-Temperature Superconductors-Multilayers, Interfaces, and Applications.

"Examination of Particles and Outgrowths on the Surface of Epitaxial  $\text{YBa}_2\text{Cu}_3\text{O}_7$  Thin Films"  
M.G. Norton, R.R. Biggers, I. Maartense and J.L. Brown  
Spring MRS Mtg., San Francisco, CA (Apr 1994) Symposium F: Epitaxial Oxide Thin Films and Heterostructures.

"Multi-Component Behavior of YBCO Films made by Pulsed Laser Deposition"  
I. Maartense, R.R. Biggers, T.L. Peterson, and M.G. Norton  
Spring MRS Mtg., San Francisco, CA (Apr 1994) Symposium S: High-Temperature Superconductors-Multilayers, Interfaces, and Applications.

"The Effect of Oxygen Annealing on the Superconductive Properties of  $2223\text{-TiBaCaCuO}$  Thin Films"  
I. Maartense, T. L. Peterson, W. L. Holstein, and L. A. Parisi  
Spring MRS Meeting, San Francisco CA (Apr 1994) Symposium S: High-Temperature Superconductors-Multilayers, Interfaces, and Applications.

"A Monte Carlo Model of GaAs [111]B Epitaxy"

D.L. Dorsey, R. Venkatasubramanian, M.Y. Yen, and T.W. Haas  
Spring MRS meeting, San Francisco, CA (April 1994)

"Growth, Processing, and Optical Properties of ZnGeP<sub>2</sub>"

M.C. Ohmer, F.K. Hopkins, R. DeDomenico, V.A. McMillan, and P.J. Drevinsky  
TTCP Workshop on Mid-Infrared Lasers, Quebec City, Canada (April 1994)

"Electrical properties of GaAs Grown by MOMBE with triethylgallium and tris-dimethylaminoarsenic," W. C. Mitchel, Matthew Roth, H. K. Dong, N. I. Li, and C. W. Tu  
Electronic Materials Conference, Boulder, CO (Jun 1994)

"Investigation of High Field Effects in Silicon Carbide,"

T. S. Sudarshan, G. Gardinaru, G. Korony, W. C. Mitchel, and W. C. Nunnally  
International Conference on High Temperature Electronics, Charlotte, NC (5-10 Jun 1994)

"Characterization of Impurity Incorporation in 6H-SiC Grown By Physical Vapor Transport,"

N. I. Buchan, S. Choi, D. Henshall, W. S. Yoo, M. A. Tischler, M. Roth, and W. C. Mitchel  
International Conference on High Temperature Electronics, Charlotte, NC (5-10 Jun 1994)

"Ohmic Contacts to 6H-SiC Semiconductors"

S. Adams, C. Severt, J. Leonard, S. Liu, and S.R. Smith  
International Conference on High Temperature Electronics, Charlotte, NC (5-10 Jun 1994)

"Electron and Scanning Probe Microscopies in the Study of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Film Growth"

M. Grant Norton, Rand R. Biggers, Iman Maartense, E. K. Moser, and Jeff L. Brown  
52nd. Annual Meeting of the Microscopy Society of America, New Orleans LA (July 1994)

"New Nonlinear Optical Crystals for Infrared Countermeasures"

F. Kenneth Hopkins & Nils C. Fernelius  
Paper E-7 at the 1994 IRIS Materials Specialty Group Symposium, Boulder, CO (16 August 94)

"Calculation and Measurement of the Bound-to-Continuum Infrared Absorption in p-Type GaAs/AlGaAs Quantum Wells"

F. Szmulowicz and G.J. Brown  
7th International Conf. of Superlattices, Microstructures and Microdevices (ICSMM-7), Banff, Alberta, Canada (22-26 August 1994)

"Pressure as a Probe of Deep Levels and Defects in Semiconductors: Antisites and Oxygen in GaAs,"

G. A. Samara, M. Skowronski, and W. C. Mitchel,  
6th Int'l Conf. on High Pressure Semiconductor Physics, Vancouver, BC (Aug 1994)

"Deep Levels in undoped, bulk 6H-SiC and associated impurities: Application of optical admittance spectroscopy to SiC"

W. C. Mitchel, M. Roth, S. R. Smith, A. O. Evwaraye, and J. S. Solomon  
21st International Symposium on Compound Semiconductors, San Diego, CA (18-22 Sep 94)

## 6.6 SUBMITTED/ACCEPTED FOR PRESENTATION IN FY95

(Invited) "The Physics of Normal Incidence Absorption in p-type GaAs/AsGaAs Quantum Well Infrared Detectors"

G.J. Brown and F. Szmulowicz  
2nd Intl. Symp. on 2-20 $\mu$ m Wavelength Infrared Detectors: Physics and Applications, Miami, FL (10-12 Oct 1994)

"Improved Sellmeier Coefficients for Potassium Titanyl Arsenate, KTiOAsO<sub>4</sub> (KTA)"

D.L. Fenimore, K.L. Schepler, U.B. Ramabadran, and Sandy McPherson  
10th Interdisciplinary Laser Science Conference (ILS-X), Dallas TX (2-7 October 1994)

"Growth and Characterization of Gallium Selenide Crystals for Far-Infrared Conversion Devices"

N.B. Singh, T. Henningsen, J.P. McHugh, D.R. Suhre, R. Mazelsky, N. Fernelius & F.K. Hopkins  
American Conference on Crystal Growth - East, Atlantic City, NJ (4-7 October 1994)

"Microwave properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> films determined from transmission and reflection"

E. K. Moser  
Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Microstructure and Properties of  $\text{YBa}_2\text{Cu}_3\text{O}_7$  Thin Films Grown on Vicinal  $\text{LaAlO}_3$  Substrates"

R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey, M.A. Capano, J. Talvacchio, J.L. Brown, and J.D. Wolf

Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Self-Heating Hotspot Effects in HTS Thin Films"

T.L. Peterson, I. Maartense, and Rand R. Biggers

Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Transport Properties of YBCO Films on Ultra-Thin Ag Layers"

C. Zhong, S.T. Ruggiero, R. Fletcher, and E. Moser

Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Theoretical Study of Step Roughening Dynamics on Vicinal GaAs [111]B Surfaces"

D.L. Dorsey, R. Venkatasubramanian and K. Mahalingam

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Kinetics of Indium Incorporation during MBE of Indium Arsenide: A Monte Carlo Simulation Study"

K. Mahalingam, D.L. Dorsey and R. Venkatasubramanian

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Heuristic Rules for Group-IV Dopant Site Selection in III-V Compounds"

R. Venkatasubramanian, K. Mahalingam and D.L. Dorsey

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"New Polymer Materials for Optical Applications--Chitosan and Its Derivatives"

Hao Jiang, Weijie Su, Steve Caracci, Tomas Cooper, Tim Bunning, Robert Crane and W Adams

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Electron Beam Processing of  $\text{ZnGeP}_2$ , A Nonlinear Optical Material for the Infrared"

P. J. Drevinsky, P. G. Schunemann, T. M. Pollak, M. C. Ohmer, W. C. Mitchel, and N. C. Fernelius

Symposium A- Beam-Solid Interactions for Materials Synthesis and Characterization, Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Gamma Ray Processing Of  $\text{ZnGeP}_2$ , A Nonlinear Optical Material For The Infrared"

P. J. Drevinsky, P. G. Schunemann, and T. M. Pollak, M. C. Ohmer

Symposium A- Beam-Solid Interactions for Materials Synthesis and Characterization, Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Examination of Outgrowths and Other  $\text{YBa}_2\text{Cu}_3\text{O}_7$  Thin Film Properties as a Function of Laser Frequency"

Rand R. Biggers, Iman Maartense, David Dempsey, M. Grant Norton, E. Moser, and Jeff Brown

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Thermal and Optical Admittance Studies of High Resistivity 6H-SiC"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel

Spring MRS Meeting, San Francisco, CA (17-21 April 1995)

"Frequency Characteristics of Metal-Semiconductor Contacts on 6H-SiC,"

S. R. Smith, A. O. Evwaraye, and W. C. Mitchel,

Spring MRS Meeting, San Francisco, CA (17-21 April 1995)

"Temperature Dependence of Metal-Semiconductor Contacts on 6H-SiC,"

S. R. Smith, A. O. Evwaraye, and W. C. Mitchel

Spring MRS Meeting, San Francisco, CA (17-21 April 1995)

## 6.0 PATENTS, SCIENTIFIC PUBLICATIONS, & PRESENTATIONS

### 6.1 PATENTS

"Laminated Upper Cladding Structure For A Light Emitting Device"

Mike Ludowise, Nick Holonyak Jr., Steve Caracci, Michael Krames, Fred Kish  
Number 08/193,681

"Modified GaSe Crystals for High Power NLO Applications"

N.B. Singh, V. Balakrishna, T. Henningsen, J.D. Adam and N.C. Fernelius  
Westinghouse Disclosure No. RDS 95-022

"Improvement in GaSe Crystals by Annealing"

N.B. Singh, V. Balakrishna, T. Henningsen, J.D. Adam and N.C. Fernelius  
Westinghouse Disclosure No. RDS 95-023

### 6.2 FY95 PUBLICATIONS

#### 6.2.1 Ph.D. Thesis:

"A Study of p-Type GaAs/AlGaAs Multi-Quantum Well Materials for Normal Incidence Detection of Infrared Radiation"

Gail J. Brown

Doctoral Dissertation, University of Dayton, Dept. of Materials Science (1994)

#### 6.2.2 M.S. Thesis

"LP-MOCVD Growth and Characterization of III-Nitrides"

Adam Saxler

M.S. Thesis, Northwestern University, Electrical Engineering Dept. (1995)

#### 6.2.3 Invited Publications/Presentations:

(Invited Book Chapter)

"Normal Incidence Detection of Infrared Radiation in P-type GaAs/AlGaAs Quantum Well Structures"

G. J. Brown and F. Szmulowicz

Long-Wavelength Infrared Detectors, ed. M. Razeghi, Gordon Breach Publishers, Inc., Philadelphia, PA (1995)

(Invited)"Modeling of Normal Incidence Absorption in p-Type GaAs/AlGaAs Quantum Well Infrared Detectors"

G.J. Brown and F. Szmulowicz

Optoelectronic Integrated Circuit Materials, Physics and Devices eds. M. Razeghi, Y.S. Park and G.L. Witt,  
SPIE Proc. 2397, 461 (1995)

(Invited) "A calculation of third-order optical susceptibilities due to excitonic nonlinearities in rectangular GaAs/AlGaAs quantum well wires with finite Al-graded band offsets included"

F.L. Madarasz, F. Szmulowicz and F.K. Hopkins

Optoelectronic Integrated Circuit Materials, Physics and Devices eds. M. Razeghi, Y.S. Park and G.L. Witt,  
SPIE Proc. **2397**, 134 (1995)

(Invited) "The Physics of Normal Incidence Absorption in p-type GaAs/AlGaAs Quantum Well Infrared Detectors"

G.J. Brown and F. Szmulowicz

Long-Wavelength Infrared Detectors: Physics and Applications, eds. V. Swaminathan, S. Li, T.S. Faska, H.C. Liu and F. Radpour, Electrochem. Soc. Proc. **94-30**, 164 (1995)

(Invited George Rappaport Award Lecture) "My work in Various Spectroscopies"

Nils Fernelius

Ohio Valley Section of the Society for Applied Spectroscopy, Fairborn, OH (11 May 1995)

#### 6.2.4 Published in Refereed Journals:

(Review) "Properties of Gallium Selenide Single Crystal"

Nils C. Fernelius

Progress in Crystal Growth and Characterization of Materials **28**, 275-353 (1994)

"Direct Measurement of ZnGeP<sub>2</sub> Birefringence from 0.66 to 12.2μm Using Polarized Light Interference"

D.W. Fischer, M.C. Ohmer, P.G. Schunemann, and T.M. Pollak

J. Appl. Phys. **77**, 5942 (1995)

"Infrared corrected Sellmeier coefficients for potassium titanyl arsenate"

D.L. Fenimore, K.L. Schepler, Uma B. Ramabadran and S.R. McPherson

J. Opt. Soc. Am., **B12**, 794 (1995)

"Defects responsible for gray tracks in flux-grown KTiOPO<sub>4</sub>"

M.P. Sripsick, D.N. Lolacono, J. Rottenberg, S.H. Goellner, L.E. Halliburton and F.K. Hopkins

Appl. Phys. Lett. **66**, 3428 (1995)

"Excitonic Nonlinear Optical Processes in GaAs Quantum Well Wires"

R.O. Klepfer, F.L. Madarasz, and F. Szmulowicz

Phys. Rev. B **51**, 4633 (1995)

"Temperature and Many Body Effects on the Intersubband Transition in a GaAs/Al<sub>0.3</sub>Ga<sub>0.7</sub>As Multiple Quantum Well"

F. Szmulowicz, M.O. Manasreh, C.E. Stutz, and T. Vaughan

Phys. Rev. B **50**, 11618 (1994)

"Calculation and Photoresponse Measurement of the Bound-to-Continuum Infrared Absorption in p-type GaAs/AlGaAs Quantum Wells"

Frank Szmulowicz and Gail J. Brown

Phys. Rev. B **51**, 13203 (1995)

"Superlattice Parameters for Optimum Absorption in InAs/InGaSb Superlattice Infrared Detectors"

E.R. Heller, K. Fisher, F. Szmulowicz and F.L. Madarasz

J. Appl. Phys. **77**, 5739 (1995)

"Background Limited Performance in p-doped GaAs/GaInAsP Quantum Well Infrared Photodetectors"

J. Hoff, S. Kim, M. Erdtmann, R. Williams, J. Piotroski, E. Bigan, M. Razeghi and G.J. Brown

Appl. Phys. Lett. **67**, 22 (1995)

"Calculation of Resonant Absorption and Phototoresponse Measurement in p-type GaAs/AlGaAs Quantum Wells"

Frank Szmulowicz and Gail J. Brown

Appl. Phys. Lett. **66**, 1659 (1995)

"Photoresponse Study of Normal Incidence Detection in P-Type GaAs/AlGaAs MQWs"

G.J. Brown, F. Szmulowicz, and S.M. Hegde

Journal of Electron. Mat. **24**, 559 (1995)

"Derivation of a General Expression for the Momentum Matrix Elements within the Envelope-Function Approximation"  
F. Szmulowicz  
Phys. Rev. B **51**, 1613 (1995)

"P-doped GaAs/GaInP Quantum Well Intersubband Photodetectors"  
J. Hoff, X. He, M. Erdtmann, E. Bigan, M. Razeghi and G.J. Brown  
J. Appl. Phys. **78**, 2126 (1995)

"Molecular-beam-epitaxy doping kinetics: A rate equation model"  
S. Bendi, R. Venkatasubramanian and D. L. Dorsey  
J. Appl. Phys. **76**, 5202 (1994)

"Electronic properties of AlGaSb/InAs quantum wells,"  
I. Lo, W. C. Mitchel, and J.-P. Cheng,  
Phys Rev B **50**, 5316 (1994).

"Evidence for a Stable Excitonic Ground State in a Spatially Separated Electron-Hole System"  
J.-P. Cheng, J. Kono, B.D. McCombe, I. Lo, W.C. Mitchel, and C.E. Stutz  
Phys Rev Lett. **74**, 450 (1995)

"Low temperature photoluminescence of Te-doped GaSb grown by liquid phase electro-epitaxy"  
S. Iyer, L. Small, S.M. Hegde, K.K. Bajaj and A. Abul-Fadl  
J. Appl. Phys. **77**, 5902 (1995)

"Second subband population in  $\delta$ -doped AlInAs/GaInAs heterostructures"  
I. Lo, W. C. Mitchel, M. Ahoujja, J.-P. Cheng, A. Fathimulla and H. Mier  
Appl. Phys. Lett. **66**, 754 (1995)

"Interface roughness scattering in thin, undoped GaInP/GaAs quantum wells,"  
W. C. Mitchel, G. J. Brown, I. Lo, S. Elhamri, M. Ahoujja, K. Ravindran, R. S. Newrock, M. Razeghi, and X. He,  
Appl. Phys. Lett. **65**, 1578 (1994).

"Observation of a negative persistent photoconductivity effect in InGaSb/InAs quantum wells,"  
I. Lo, W. C. Mitchel, R. Kaspi, S. Elhamri, and R. S. Newrock,  
Appl. Phys. Lett. **65**, 1024 (1994).

"Determination of alloy composition in modulation doped AlGaAs/GaAs heterostructure"  
D.P. Wang, Ikai Lo, J.L. Chern and W.C. Mitchel  
J. Appl. Phys. **77**, 172 (1995)

"A Study of Chemical Beam Epitaxy of GaAs Using Tris-dimethylaminoarsenic"  
H.K. Dong, N.Y. Li, C.W. Tu, M. Geva and W.C. Mitchel  
J. Electron. Matls. **24**, 69 (1995)

"Persistent photoconductivity in thin undoped GaInP/GaAs quantum wells,"  
S. Elhamri, M. Ahoujja, K. Ravindran, R. S. Newrock, W. C. Mitchel, G. J. Brown, I. Lo,  
Manijeh Razeghi and X. He  
Appl. Phys. Lett. **66**, 171 (1995)

"General expression for optical transition probabilities in the envelope-function approximation"  
Frank Szmulowicz  
Pis'ma Zh. Eksp. Teor. Fiz. **60**, 731 (1994)  
JETP Lett. **60**, 751 (1994)

"Temperature Dependence of Photoluminescence Linewidth in Modulation Doped Pseudomorphic High Electron Mobility Transistor  $\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{In}_y\text{Ga}_{1-y}\text{As}/\text{GaAs}$  Structures"  
P.W. Yu, B. Jogai, T.J. Rogers, P.A. Martin, and J.M. Ballingall  
Appl. Phys. Lett. **65**, 3263 (1994)

"Cyclotron-resonance oscillations in a two-dimensional electron-hole system"  
J. Kono, B.D. McCombe, J.-P. Cheng, I. Lo, W.C. Mitchel and C.E. Stutz  
Phys. Rev. B **50**, 12242 (1994)

"High quality AlN and GaN epilayers grown on (00•1) sapphire, (100) and (111) silicon substrates"  
P. Kung, A. Saxler, X. Zhang, D. Walker, T.C. Wang, I. Ferguson and M. Razeghi  
Appl. Phys. Lett. **66**, 2958 (1995)

"Growth of AlGa<sub>N</sub>:Ge on sapphire and silicon substrates"  
X. Zhang, P. Kung, A. Saxler, D. Walker, T.C. Wang and M. Razeghi  
Appl. Phys. Lett. **67**, 1745 (1995)

"Persistent photoconductance in n-type 6H-SiC"  
A.O. Evwaraye, S.R. Smith and W.C. Mitchel  
J. Appl. Phys. **77**, 4477 (1995)

"Vanadium Related near-band-edge Absorption Bands in three SiC polytypes"  
J.R. Jenny, M. Skowronski, W.C. Mitchel, H.M. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins  
J. Appl. Phys. **78**, 3160 (1995)

"On the compensation mechanism in high-resistivity 6H-SiC doped with vanadium"  
J.R. Jenny, M. Skowronski, W.C. Mitchel, H.M. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins  
J. Appl. Phys. **78**, 3839 (1995)

"Semi-insulating 6H-SiC Grown by Physical Vapor Transport"  
H.McC. Hobgood, R.C. Glass, G. Augustine, R.H. Hopkins, J. Jenny, M. Skowronski, W.C. Mitchel and M. Roth  
Appl. Phys. Lett. **68**, 1364 (1995)

"Kinetics of slow buildup of photoconductance in n-type 6H-SiC"  
A. O. Evwaraye, S. R. Smith and W. C. Mitchel  
Appl. Phys. Lett. **66**, 2691 (1995).

"Examination of electrical and optical properties of vanadium in bulk n-type silicon carbide"  
A O. Evwaraye, S. R. Smith and W. C. Mitchel  
J. Appl. Phys. **76**, 5769 (1994)

"*In Situ* Transmission Electron Microscopy Observations of Twinning in Lanthanum Aluminate"  
M. Grant Norton and Rand R. Biggers  
Scripta Metallurgica et Materialia **32**, 481 (1995)

"Surface Outgrowths on Laser-Deposited YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films"  
M.G. Norton, R.R. Biggers, I. Maartense, E. K. Moser and J.L. Brown  
Physica C **233**, 321 (1994)

"YBCO Film Growth on Ultra-Thin Ag Layers"  
C. Zhong, S.T. Ruggiero, R. Fletcher and E. Moser  
J. of Matls. Res. **9**, 2761 (1994)

"Defects and Anomalous Film Growth at the edge of single Crystal Substrates"  
M. Grant Norton, Rand R. Biggers, and Iman Maartense  
J. of Materials Science Letters **14**, 851 (1995)

#### 6.2.5 Published in Refereed Conference Proceedings:

"Aluminum-free Quantum Well Intersubband Photodetectors with p-Type GaAs Wells and Lattice-matched Ternary and Quaternary Barriers"

J. Hoff, E. Bigan, G.J. Brown and M. Razeghi

Optoelectronic Integrated Circuit Materials, Physics and Devices eds. M. Razeghi, Y.S. Park and G.L. Witt, SPIE Proc. **2397**, 445 (1995)

"Intersubband Transitions in InGaAs/AlGaAs Multiple Quantum Wells"

F. Szmulowicz, M.O. Manasreh, C. Kutsche, and C.E. Stutz

Mat. Res. Soc. Symp. Proc. **299**, 53 (1994)

"Chemical Beam Epitaxy (CBE) and Laser-Enhanced CBE of GaAs using Tris-dimethylaminoarsenic"

H.K. Dong, N.Y. Li, C.W. Tu, M. Geva and W.C. Mitchel

MRS Symposium Proceedings Series **340**, 173 (1994)

"Rapid thermal annealing effects on the structural integrity of InAlAs/GaAsSb HIGFET epilayers on InP"

K.G. Merkel, D.L.A. Cernay, R.T. Lareau, V.M. Bright, P.W. Yu and F.L. Schuermeyer

Inst. Phys. Conf. Ser. **141**, 727 (1995)

"Growth of InGaP<sub>2</sub> by LP-MOCVD and Characterization of Lattice Ordering"

V. E. Stenger, P. B. Kosel, S. M. Hegde, and M. C. Ohmer

Proc. of SOTAPOCS XVIII, Electrochem. Soc. Proc. **93-27**, 75 (1994)

"Low Pressure Metalorganic Chemical Vapor Deposition of High Quality AlN and GaN Thin Films on Sapphire and Silicon Substrates"

P. Kung, X. Zhong, E. Bigan, M. Razighi and A. Saxler

Optoelectronic Integrated Circuit Materials, Physics and Devices eds. M. Razeghi, Y.S. Park and G.L. Witt, SPIE Proc. **2397**, 311 (1995)

"Characterization of Deep Defects in n-type 6H-SiC Single Crystals by Optical Admittance Spectroscopy"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel

Mater. Res. Soc. Proc. **339**, 711 (1994)

"Temperature Dependence of Metal-Semiconductor Contacts on 6H-SiC,"

S. R. Smith, A. O. Evwaraye, and W. C. Mitchel

Proc. Mats. Res. Soc. **378**, 835 (1995)

"Study of Deep Levels by Admittance Spectroscopy in High Resistivity p-type 6H-SiC single Crystals"

A.O. Evwaraye, S.R. Smith and W.C. Mitchel

Proc. Mats. Res. Soc. **378**, 539 (1995)

"Deep Levels in Undoped Bulk 6H-SiC and Associated Impurities: Application of Optical Admittance Spectroscopy"

W.C. Mitchel, Matthew Roth, S.R. Smith, A.O. Evwaraye, and J. Solomon

Inst. Phys. Conf. Ser. **141**, 411 (1995)

"Examination of Particles and Outgrowths on the Surface of Epitaxial YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films"

M.G. Norton, R.R. Biggers, I. Maartense and J.L. Brown

Epitaxial Oxide Thin Films and Heterostructures

Mat. Res. Soc. Symp. Proc. **341**, 183 (1994)

"Electron and Scanning Probe Microscopies in the Study of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Film Growth"

M. G. Norton, R. R. Biggers, I. Maartense, E. K. Moser, and J. L. Brown

Proceedings of the 52nd Annual Meeting of the Microscopy Society of America, p. 810 (1994)

"Microstructure and Properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films Grown on Vicinal LaAlO<sub>3</sub> Substrates"

R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey, M.A. Capano, J. Talvacchio, J.L. Brown, and J.D. Wolf

IEEE Trans. on Appl. Supercond. **5**, 1241 (1995)

"Self-Heating Hotspot Effects in HTS Thin Films"

T.L. Peterson, I. Maartense, and Rand R. Biggers

IEEE Trans. on Appl. Supercond. **5**, 1436 (1995)

"Transport Properties of YBCO Films on Ultra-Thin Ag Layers"

C. Zhong, S.T. Ruggiero, R. Fletcher, and E. Moser

IEEE Trans. on Appl. Supercond. **5**, 1529 (1995)

#### 6.2.6 Non-Refereed Publications:

"New Nonlinear Optical Crystals for Infrared Countermeasures"

F. Kenneth Hopkins & Nils C. Fernelius

Proceedings 1994 IRIS Materials Specialty Group Symposium, p. 353 (August 1994)

"Computational Methods for Modeling Semiconductor Thin-Film Epitaxy"

D. L. Dorsey

Mini-Symposium on Computational Materials Science Research

eds. R. Pachter, B. L. Farmer and W. Adams, (WL-TR-95-4008) (1995)

"Infrared Materials: Nonlinear Materials Extend Spectral Range of High-Power Lasers"

F. Kenneth Hopkins

Laser Focus World **31**, 87 (July 1995)

"Nonlinear Optical Crystal Development at the USAF Wright Laboratory"

F.K. Hopkins, N.C. Fernelius, M.C. Ohmer, D.E. Zelmon and U.B. Ramabadran

Proc. National Aerospace Electron. Conf. (NAECON), p. 914 (1995)

#### 6.3 ACCEPTED FOR PUBLICATION

"Exciton/biexciton energies in rectangular GaAs/AlGaAs quantum well wires including finite Al-graded band offsets with application to third-order optical susceptibilities"

F.L. Madarasz, F. Szmulowicz and F.K. Hopkins

Phys. Rev. B

"Persistent Photoconductivity Effect in d-doped AlInAs/GaInAs Heterostructures"

I. Lo, D.P. Wang, K.Y. Hsieh, T.F. Wang, W.C. Mitchel, M. Ahoujja, J.-P. Cheng, A. Fathimulla and H. Hier

Phys. Rev. B

"Determination of the band offsets of the 4H-SiC/6H-SiC heterojunction using the vanadium donor (0/+) level as a reference"

A. O. Evwaraye, S. R. Smith, and W. C. Mitchel

Appl. Phys. Lett.

"Optical admittance studies of vanadium donor level in high resistivity p-type 6H-SiC,"

A. O. Evwaraye, S. R. Smith, and W. C. Mitchel

J. Appl. Phys.

"High field effects in high resistivity silicon carbide in lateral configurations"

T. S. Sudarshan, G. Gradinaru, G. Korony, W. Mitchel and R. H. Hopkins

Appl. Phys. Lett.

"Atomistic Calculations of Defects in ZnGeP<sub>2</sub>"

P. Zapol, R. Pandey, M.C. Ohmer and J. Gale

J. Appl. Phys.

"Electron Beam Processing of ZnGeP<sub>2</sub>, A Nonlinear Optical Material for the Infrared"

P. G. Schunemann, P. J. Drevinsky, M. C. Ohmer, W. C. Mitchel, and N. C. Fernelius

Proceedings Symposium A- Beam-Solid Interactions for Materials Synthesis and Characterization, Mats. Res. Soc. (1995)

"Gamma Ray Processing of ZnGeP<sub>2</sub>, A Nonlinear Optical Material For The Infrared"

P. G. Schunemann, P. J. Drevinsky and M. C. Ohmer

Proceedings Symposium A- Beam-Solid Interactions for Materials Synthesis and Characterization, Mats. Res. Soc. (1995)

"Observations on the growth of YBaCuO thin films at very high laser fluences"

R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey and J.L. Brown

Film Synthesis and Growth Using Energetic Beams

Mats. Res. Soc. Symposium Proc. (1995)

"Spectroscopic Ellipsometric Characterization of Low Temperature GaAs"

X. Gao, P.G. Snyder, P.W. Yu, Y.Q. Zhang and Z.F. Peng

Proc. Mats. Res. Soc. (1995)

"Optimization of Absorption in InAs/InGaSb Superlattices for Long Wavelength Infrared Detection"

F. Szmulowicz, E.R. Heller, K. Fisher and F.L. Madarasz

Superlatt. Microstruct.

"Analysis of Spectral Response in p-type GaAs/GaInP Quantum Well Infrared Photodetectors"

J. Hoff, C. Jelen, S. Slivken, E. Bigan, M. Razeghi and G.J. Brown

Superlatt. Microstruct.

"Persistent Photoconductivity in Thin Undoped GaInP/GaAs Quantum Wells"

M. Ahoujja, S. Elhamri, D.B. Mast, R.S. Newrock, W.C. Mitchel, G.J. Brown, M. Razeghi and X. He

Superlatt. Microstruct.

"Interface Roughness Scattering in Thin, Undoped GaInP/GaAs Quantum Wells"

S. Elhamri, M. Ahoujja, D.B. Mast, R.S. Newrock, W.C. Mitchel, G.J. Brown, M. Razeghi and X. He

Superlatt. Microstruct.

"Characterization of Boron in 6H-SiC Using Optical Absorption"

P.W. Yu, K. Mahalingam, W.C. Mitchel, M.D. Roth and D.W. Fischer

Proceedings of the 22nd International Symposium on Compound Semiconductors, Cheju Island, Korea (28 Aug - 2 Sept 1995)

"Background Limited Performance in p-doped GaAs/GaInP Quantum Well Infrared Photodetectors"

J. Hoff, S. Kim, M. Erdtmann, R. Williams, J. Piotrowski, E. Bigan, G.J. Brown and M. Razeghi

Proceedings of the 22nd International Symposium on Compound Semiconductors, Cheju Island, Korea (28 Aug - 2 Sept 1995)

"Determination of the Conduction Band Discontinuity in an n-type 3C-SiC/6H-SiC Heterojunction"

S.R. Smith, A.O. Evwaraye, A.J. Steckl, C. Yuan, W.C. Mitchel and M.D. Roth

Proceedings of the 6th International Conf. on Silicon Carbide and Related Materials (ICSCRM-95), Kyoto, Japan (18-21 Sept 1995)

"Electronic Properties of Semi-insulating Vanadium-doped 6H-SiC"

W.C. Mitchel, M. Roth, A.O. Evwaraye, P.W. Yu, S.R. Smith, J. Jenny, M. Skowronski, H.McD. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins

Proceedings of the 6th International Conf. on Silicon Carbide and Related Materials (ICSCRM-95), Kyoto, Japan (18-21 Sept 1995)

"In Situ Electron Microscopy Study of Structural Transformations on Single Crystal Lanthanum Aluminate"

M. G. Norton, J. Bentley and R. R. Biggers

Proc of the 53rd Annual Meeting of the Microscopy Society of America (1995)

"Scanning Probe Microscopy Study of the Growth of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films"

M. G. Norton, R. R. Biggers, E. K. Moser, T. L. Peterson and I. Maartense

Proc of the 53rd Annual Meeting of the Microscopy Society of America (1995)

#### 6.4 SUBMITTED FOR PUBLICATION

"Relationship of the Second Order Nonlinear Optical Coefficient to Bandgap in Inorganic Non-Centrosymmetric Crystals"

A.G. Jackson, M.C. Ohmer and S.R. LeClair

Infrared Physics

"Optical and Structural Characterization of Triallyl thiourea Cadmium Chloride (ATCC)"

Uma B. Ramabadran, Rama Vuppuladhadiam, D. Small, D.E. Zelmon and G.C. Kennedy

Applied Optics

"A dimensional parametric study of exciton/biexciton enegeries in rectangular GaAs/AlGaAs quantum well wires with and without finite band offsets"

R.O. Klepfer, F.L. Madarasz, F. Szmulowicz and F.K. Hopkins  
J. Appl. Phys.

"Optical Waveguide and Morphology of Chitosan Thin Films"

H. Jiang, W. Su, S.J. Caracci, T.J. Bunning, T.M. Cooper and W.W. Adams  
J. Appl. Polym. Sci.

"Rough Sets Applied to Materials Data"

A.G. Jackson, S.R. LeClair, M.C. Ohmer, W. Ziarko and H. Al-Kamhwi  
Acta Metallurgica et Materialia

"Influence of Physisorbed Arsenic on RHEED Intensity Oscillations during Low-Temperature GaAs Molecular Beam Epitaxy"

R. Venkatasubramanian, V. K. Pamula and D. L. Dorsey  
J. Appl. Phys.

"Effect of Barrier Material on the Two-Dimensional Electron Gas in  $\delta$ -doped GaInAs-based Quantum Wells"

I. Lo, W.C. Mitchel, P.W. Yu, A. Fathimulla and H. Hier  
Appl. Phys. Lett.

"Deep-center oxygen related photoluminescence in GaAs doped with dimethylaluminum methoxide during organometallic vapor phase epitaxy"

P.W. Yu, Y. Park, M. Skowronski and M.L. Timmons  
J. Appl. Phys.

"Shallow and deep levels in n-type 4H-SiC,"

A. O. Evwaraye, S. R. Smith, and W. C. Mitchel  
J. Appl. Phys.

"Optical and electrical characterization of boron impurities in silicon carbide grown by physical vapor transport"

J. R. Jenny, M. Skowronski, W. C. Mitchel, H. M. Hobgood, R. C. Glass, G. Augustine and R. H. Hopkins  
Journal of Applied Physics.

"Temperature dependence of the barrier height of metal-semiconductor contacts on 6H-SiC,"

S. R. Smith, A. O. Evwaraye and W. C. Mitchel  
J. Appl. Phys.

"Kinetics of photoconductivity in n-type GaN photodetector"

P. Kung, X. Zhang, D. Walker, A. Saxler, J. Piotrowski, A. Rogalski and M. Razeghi  
Appl. Phys. Lett.

"Photovoltaic effects in GaN structures with p-n junction"

X. Zhang, P. Kung, D. Walker, J. Piotrowski, A. Rogalski, A. Saxler and M. Razeghi  
Appl. Phys. Lett.

"High Field Activation of Micropipes in High Resistivity Silicon Carbide"

T.S. Sudarshan, G. Gradinaru, G. Korony, W. Mitchel and R. Hopkins  
J. Electron. Matls.

"Electronic Properties of Boron in p-type Bulk 6H-SiC"

W.C. Mitchel, M.D. Roth, A.O. Evwaraye, P.W. Yu and S.R. Smith  
J. Electron. Matls.

"Determination of the Activation Energy  $E_g$  for Impurity Conduction in n-type 4H-SiC"

A.O. Evwaraye, S.R. Smith, W.C. Mitchel and M.D. Roth  
Appl. Phys. Lett.

(Invited) "Deep Levels in 6H-SiC as Studied by Admittance Spectroscopy Techniques"  
W.C. Mitchel, A.O. Evwaraye and S.R. Smith  
Wide BandGap Semiconductors and Device Symposium  
188th Electrochemical Soc. Mtg. (Oct 1995)

## 6.5 FY95 PRESENTATIONS (Chronological)

(Invited) "The Physics of Normal Incidence Absorption in p-type GaAs/AsGaAs Quantum Well Infrared Detectors"  
G.J. Brown and F. Szmulowicz  
2nd Intl. Symp. on 2-20 $\mu$ m Wavelength Infrared Detectors: Physics and Applications, Miami, FL (10-12 Oct 1994)

"Improved Sellmeier Coefficients for Potassium Titanyl Arsenate,  $\text{KTiOAsO}_4$  (KTA)"  
D.L. Fenimore, K.L. Schepler, U.B. Ramabadran, and Sandy McPherson  
10th Interdisciplinary Laser Science Conference (ILS-X), Dallas TX (2-7 October 1994)

"Growth and Characterization of Gallium Selenide Crystals for Far-Infrared Conversion Devices"  
N.B. Singh, T. Henningsen, J.P. McHugh, D.R. Suhre, R. Mazelsky, N. Fernelius & F.K. Hopkins  
American Conference on Crystal Growth - East, Atlantic City, NJ (4-7 October 1994)

"Photoluminescence of Vanadium Doped SiC"  
W.A. Davis, R.L. Hengehold, Y.K. Yeo, and W.C. Mitchel  
The Bull. of the APS **40**, 1475 (1995)

"Optimization of Absorption in InAs/InGaSb Superlattices for Long Wavelength Infrared Detection"  
E.R. Heller, F. Szmulowicz, K. Fisher, and F.L. Madarasz  
The Bull. of the APS **40**, 1482 (1995)

"Reflections and Refractions in a Cone: Conchoid of Nicomedes"  
F. Szmulowicz  
The Bull. of the APS **40**, 1484 (1995)

"Microwave properties of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  films determined from transmission and reflection"  
E. K. Moser  
Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Microstructure and Properties of  $\text{YBa}_2\text{Cu}_3\text{O}_7$  Thin Films Grown on Vicinal  $\text{LaAlO}_3$  Substrates"  
R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey, M.A. Capano, J. Talvacchio, J.L. Brown, and J.D. Wolf  
Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Self-Heating Hotspot Effects in HTS Thin Films"  
T.L. Peterson, I. Maartense, and Rand R. Biggers  
Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Transport Properties of YBCO Films on Ultra-Thin Ag Layers"  
C. Zhong, S.T. Ruggiero, R. Fletcher, and E. Moser  
Applied Superconductivity Conference, Boston, MA (16-21 October 1994)

"Nonlinear Optical Crystal Development at the USAF Wright Laboratory"  
F.K. Hopkins  
Physics & Materials Science Joint Seminar, Bowling Green State Univ., OH (9 Nov 94)

"Theoretical Study of Step Roughening Dynamics on Vicinal GaAs [111]B Surfaces"  
D.L. Dorsey, R. Venkatasubramanian and K. Mahalingam  
Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Kinetics of Indium Incorporation during MBE of Indium Arsenide: A Monte Carlo Simulation Study"  
K. Mahalingam, D.L. Dorsey and R. Venkatasubramanian  
Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Heuristic Rules for Group-IV Dopant Site Selection in III-V Compounds"

R. Venkatasubramanian, K. Mahalingam and D.L. Dorsey

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"New Polymer Materials for Optical Applications--Chitosan and Its Derivatives"

Hao Jiang, Weijie Su, Steve Caracci, Thomas Cooper, Tim Bunning, Robert Crane and W Adams

Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Electron Beam Processing of ZnGeP<sub>2</sub>, A Nonlinear Optical Material for the Infrared"

P. G. Schunemann, P. J. Drevinsky, M. C. Ohmer, W. C. Mitchel, and N. C. Fernelius

Symposium A- Beam-Solid Interactions for Materials Synthesis and Characterization, Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Gamma Ray Processing of ZnGeP<sub>2</sub>, A Nonlinear Optical Material For The Infrared"

P. G. Schunemann, P. J. Drevinsky and M. C. Ohmer

Symposium A-Beam-Solid Interactions for Materials Synthesis and Characterization, Fall MRS Meeting, Boston, MA (Nov/Dec 1994)

"Examination of Outgrowths and Other YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Film Properties as a Function of Laser Pulse Frequency"

Rand R. Biggers, M. Grant Norton, Iman Maartense, E. Moser, T.L. Peterson, D. Demspey and Jeff Brown

Fall MRS Meeting, Symposium H: High Tc Superconductivity: Materials and Applications, Boston, MA (Nov/Dec 1994)

(Invited)"Modeling of Normal Incidence Absorption in p-Type GaAs/AlGaAs Quantum Well Infrared Detectors"

G.J. Brown and F. Szmulowicz

Optoelectronic Integrated Circuit Materials, Physics and Devices, San Jose, CA (4-10 Feb 1995)

"Aluminum-free Quantum Well Intersubband Photodetectors with p-Type GaAs Wells and Lattice-matched Ternary and Quaternary Barriers"

J. Hoff, E. Bigan, G.J. Brown and M. Razeghi

Optoelectronic Integrated Circuit Materials, Physics and Devices, San Jose, CA (4-10 Feb 1995)

(Invited)"A calculation of third-order optical susceptibilities due to excitonic nonlinearities in rectangular GaAs/AlGaAs quantum well wires with finite Al-graded band offsets included"

F.L. Madarasz, F. Szmulowicz and F.K. Hopkins

Optoelectronic Integrated Circuit Materials, Physics and Devices, San Jose, CA (4-10 Feb 1995)

"Low Pressure Metalorganic Chemical Vapor Deposition of High Quality AlN and GaN Thin Films on Sapphire and Silicon Substrates"

P. Kung, X. Zhong, E. Bigan, M. Razighi and A. Saxler

Optoelectronic Integrated Circuit Materials, Physics and Devices, San Jose, CA (4-10 Feb 1995)

(Invited)"Exciton/Biexciton Energies in Rectangular GaAs/AlGaAs Quantum Well Wires Including Finite Al-Graded Band Offsets With Application to Third-Order Optical Susceptibilities"

Frank L. Madarasz and Frank Szmulowicz

Alabama AM University, Huntsville, AL (2 March 1995).

"Interface roughness scattering in thin GaInP/GaAs quantum wells"

S. Elhamri, M. Ahoujja, K. Ravindran, D.B. Mast, R.S. Newrock, W.C. Mitchel, I. Lo, M. Razeghi and X. He

Bull. Am. Phys. Soc. **40**, 252 (1995); APS March Mtg. San Jose, CA (20-24 Mar 95)

"Persistent photoconductivity in Thin Undoped GaInP/GaAs quantum wells"

M. Ahoujja, S. Elhamri, K. Ravindran, D.B. Mast, R.S. Newrock, W.C. Mitchel, I. Lo, M. Razeghi and X. He

Bull. Am. Phys. Soc. **40**, 698 (1995); APS March Mtg. San Jose, CA (20-24 Mar 95)

"Infrared Magneto Optical Characterization of  $\delta$ -Doped GaInAs/AlInAs Heterostructures"

J.-P. Cheng, I. Lo, W.C. Mitchel and A. Fathimulla

Bull. Am. Phys. Soc. **40**, 19 (1995); APS March Mtg. San Jose, CA (20-24 Mar 95)

"Magneto-optical and Transport Studies of Semiconducting and Semimetallic InAs/AlGaSb Quantum Wells"  
J. Kono, B.D. McCombe, J.-P. Cheng, I. Lo, W.C. Mitchel and C.E. Stutz  
Bull. Am. Phys. Soc. 40, 19 (1995); APS March Mtg. San Jose, CA (20-24 Mar 95)

"Polarized Raman scattering from ZnGeP single crystals"  
S. Tlali, H.E. Jackson, M.C. Ohmer, P.G. Schunemann and T.M. Pollak  
Bull. Am. Phys. Soc. 40, 760 (1995); APS March Mtg. San Jose, CA (20-24 Mar 95)

"Optical Waveguiding and Morphological Structure of Chitosan Thin Films"  
H. Jiang, W. Su, T. Bunning, S. Caracci, T. Cooper and W.W. Adams  
Bull. Am. Phys. Soc. 40, 480 (1995); APS March Mtg. San Jose, CA (20-24 Mar 95)

"Zinc Germanium Diphosphide - A Nonlinear Optical Material for Infrared Applications"  
M.C. Ohmer  
Materials Eng. Seminar, U. Dayton, (6 April 1995)

"Study of Deep Levels by Admittance Spectroscopy in High Resistivity p-type 6H-SiC Single Crystals"  
A.O. Evwaraye, S.R. Smith, and W.C. Mitchel  
Spring MRS Meeting, San Francisco, CA (17-21 April 1995)

"Temperature Dependence of Metal-Semiconductor Contacts on 6H-SiC,"  
S. R. Smith, A. O. Evwaraye, and W. C. Mitchel  
Spring MRS Meeting, San Francisco, CA (17-21 April 1995)

"Observations on the growth of YBaCuO thin films at very high laser fluences"  
R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey and J.L. Brown  
Symposium Q- Film Synthesis and Growth Using Energetic Beams, Spring MRS Meeting,  
San Francisco, CA (17-21 April 1995)

"The Effects of Substrate Misorientation on the Microstructure and Properties of YBaCuO Thin Films"  
R.R. Biggers, I. Maartense, E.K. Moser, T.L. Peterson, D. Dempsey and J.L. Brown  
Symposium K- High Temperature Superconductors-Material and Fabrication Issues for Applications, Spring MRS  
Meeting, San Francisco, CA (17-21 April 1995)

"Superconductive Instabilities in (Ba,K)-Bi-O Films"  
I. Maartense, T. L. Peterson, R. R. Biggers and R. Hu  
Symposium K- High Temperature Superconductors - Material and Fabrication Issues for Applications, Spring MRS  
Meeting, San Francisco, CA (17-21 April 1995)

"Laser Deposited YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> Films with Variations due to Plume Asymmetry"  
E. K. Moser, R. R. Biggers, I. Maartense, T. L. Peterson, J. L. Brown and M. G. Norton  
Symposium K- High Temperature Superconductors - Material and Fabrication Issues for Applications, Spring MRS  
Meeting, San Francisco, CA (17-21 April 1995)

"Spectroscopic Ellipsometric Characterization of Low Temperature GaAs"  
X. Gao, P.G. Snyder, P.W. Yu, Y.Q. Zhang and Z.F. Peng  
Spring MRS Meeting, San Francisco, CA (17-21 April 1995)

"Directions in Air Force High-Temperature Power Electronics"  
K.C. Reinhardt, J.D. Scofield and W.C. Mitchel  
Wkshp. on High Temp Electronics for Vehicles, Ft. Monmouth, NJ (26-27 Apr 1995)

"Electronic Properties of Boron in p-type Bulk 6H-SiC"  
W.C. Mitchel, M. Roth, A.O. Evwaraye, S.R. Smith and P.W. Yu  
Wkshp. on High Temp Electronics for Vehicles, Ft. Monmouth, NJ (26-27 Apr 1995)

"Electro-Optic Response of Doped High-Tg Polyimides"  
J.S. Zetts and S.J. Caracci  
Am. Phys. Soc. Mtg., OH Sec., Youngstown, OH (12-13 May 95)

"Optimization of Absorption in InAs/ InGaSb Superlattices for Long-Wavelength Infrared Detection"  
Eric R. Heller, Frank Szmulowicz, Kent Fisher and Frank L. Madarasz  
Am. Phys. Soc. Mtg., OH Sec., Youngstown, OH (12-13 May 95)

"Pressure-induced insulator-metal transition in xenon: An LMTO study"  
J.G. LePage and M. Alouani  
Electronic Structure Wrkshp, St. Mary College, Maryland, 22-24 May (1995)

"Nonlinear Optical Crystal Development at the USAF Wright Laboratory"  
F.K. Hopkins, N.C. Fernelius, M.C. Ohmer, D.E. Zelmon and U.B. Ramabadran  
National Aerospace Electronics Conference (NAECON), Dayton, OH (22-26 May 1995)

"Interface Roughness Scattering in Thin, Undoped GaInP/GaAs Quantum Wells"  
W.C. Mitchel, S. Hegde, S. Elhamri, M. Ahoujja, R.S. Newrock, M. Razeghi and M. Erdtmann  
Electron. Matls. Conf., Charlotte, VA (21-23 June 95)

"Deep Levels in p-type Bulk 6H-SiC"  
W.C. Mitchel, M. Roth, A.O. Evwaraye, S.R. Smith and P.W. Yu  
Electron. Matls. Conf., Charlotte, VA (21-23 June 95)

"High Field Activation of Micropipes in High Resistivity Silicon Carbide"  
T.S. Sudarshan, G. Gradinaru, G. Korony, W. Mitchel and R. Hopkins  
Electron. Matls. Conf., Charlotte, VA (21-23 June 95)

"Influence of Surface Physisorbed As on the RHEED Intensity Oscillations during Low-Temperature GaAs Molecular Beam Epitaxy"  
R. Venkatasubramanian and D. L. Dorsey  
Fifth Internat. Conf. on the Formation of Semiconductor Interfaces (ICFSI-5), Princeton, NJ (26-30 June 95)

"Effect of YBCO Substrate on Electromagnetic Properties of Melt-Processed YBCO Superconductor"  
G. Kozlowski, C.E. Oberly and I. Maartense  
International Cryogenic Materials Conf., Columbus, OH (20 July 1995)

"Persistent photoconductivity in thin undoped GaInP/GaAs quantum wells"  
M. Ahoujja, S. Elhamri, D.B. Mast, R.S. Newrock, W.C. Mitchel, G.J. Brown, M. Razeghi and X. He  
8th International Conf. on Superlattices, Microstructures and Microdevices (ICSMM-8), Cincinnati, OH (20-25 Aug 95)

"Interface roughness scattering in thin, undoped GaInP/GaAs quantum wells"  
S. Elhamri, M. Ahoujja, D.B. Mast, R.S. Newrock, W.C. Mitchel, G.J. Brown, M. Razeghi and X. He  
8th International Conf. on Superlattices, Microstructures and Microdevices (ICSMM-8), Cincinnati, OH (20-25 Aug 95)

"Optimization of Absorption in InAs/InGaSb Superlattices for Long Wavelength Infrared Detection"  
F. Szmulowicz, E.R. Heller and K. Fisher  
8th International Conf. on Superlattices, Microstructures and Microdevices (ICSMM-8), Cincinnati, OH (20-25 Aug 95)

"In Situ Electron Microscopy Study of Structural Transformations on Single Crystal Lanthanum Aluminate"  
M. G. Norton, J. Bentley and R. R. Biggers  
53rd Annual Meeting of the Microscopy Society of America, Kansas City, MO (Aug 1995)

"Scanning Probe Microscopy Study of the Growth of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films"  
M. G. Norton, R. R. Biggers, E. K. Moser, T. L. Peterson and I. Maartense  
53rd Annual Meeting of the Microscopy Society of America, Kansas City, MO (Aug 1995)

"Characterization of Boron in 6H-SiC Using Optical Absorption"  
P.W. Yu, K. Mahalingam, W.C. Mitchel, M.D. Roth and D.W. Fischer  
22nd International Symposium on Compound Semiconductors, Cheju Island, Korea (28 Aug - 2 Sept 1995)

"Background Limited Performance in p-doped GaAs/GaInP<sub>s</sub>P Quantum Well Infrared Photodetectors"  
J. Hoff, S. Kim, M. Erdtmann, R. Williams, J. Piotrowski, E. Bigan, G.J. Brown and M. Razeghi  
22nd International Symposium on Compound Semiconductors, Cheju Island, Korea (28 Aug - 2 Sept 1995)

"Improved phase matching predictions based upon mid-IR dispersion data for rubidium titanyl arsenate (RTA)"

Uma B. Ramabadran, Dale L. Fenimore, David E. Zelmon, David Small, Paul Von Richter and Kenneth L. Schepler  
Joint Optical Society of America Annual Meeting/Interdisciplinary Laser Science Conference,  
Portland, OR (10-15 September 1995)

"Electro-refraction and electro-absorption in poled-polymer films"

N. O'Brien, V. Dominic and S.J. Caracci  
Joint Optical Society of America Annual Meeting/Interdisciplinary Laser Science Conference,  
Portland, OR (10-15 September 1995)

"Second Harmonic Generation of Short Pulse and Long Pulse CO<sub>2</sub> Laser Radiation"

S. Guha, P.J. Hood and M.C. Ohmer  
Joint Optical Society of America Annual Meeting/Interdisciplinary Laser Science Conference,  
Portland, OR (10-15 September 1995)

"HTS Thin Film Materials for Advanced Air Force Applications"

T.L. Peterson  
AFOSR Superconductivity Workshop, Washington, DC (18 September 1995)

"Microwave characterization of HTS materials using dielectric resonator and power transmission methods"

E.K. Moser  
AFOSR Superconductivity Workshop, Washington, DC (18 September 1995)

"Electronic Properties of Semi-insulating Vanadium-doped 6H-SiC"

W.C. Mitchel, M. Roth, A.O. Evwaraye, P.W. Yu, S.R. Smith, J. Jenny, M. Skowronski, H.McD. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins  
6th International Conf. on Silicon Carbide and Related Materials (ICSCRM-95), Kyoto, Japan (18-21 Sept 1995)

"Determination of the Conduction Band Discontinuity in an n-type 3C-SiC/6H-SiC Heterojunction"

S.R. Smith, W.C. Mitchel, A.O. Evwaraye, M.D. Roth, A.J. Steckl and C. Yuan  
6th International Conf. on Silicon Carbide and Related Materials (ICSCRM-95), Kyoto, Japan (18-21 Sept 1995)

"Morphology of Two Differently Oriented GaN Grown on (11•0) Sapphire Substrates"

T. Kato, P. Kung, A. Saxler, C.J. Sun, H. Ohsato, M. Razeghi and T. Okuda  
Topical Workshop on III-V Nitrides, Nagoya, Japan (21-23 September 1995)

## 6.6 SUBMITTED/ACCEPTED FOR PRESENTATION IN FY96 (Chronological)

"Photoluminescence Spectroscopy of CdGeAs<sub>2</sub>"

J.E. McCrae, R.L. Hengehold, Y.K. Yeo, M.C. Ohmer and P.G. Schunemann  
Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Surface Morphology and Microwave Characterization of Pulsed-Laser Deposited YBaCuO Superconducting Thin Films"

E.K. Moser, R.R. Biggers, I. Maartense, T.L. Peterson, and J.L. Brown  
Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Optical Admittance Spectroscopy of 6H- and 4H SiC"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel  
Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Observed Transverse Voltage Characteristics of YBCO Superconducting Thin Films"

D.A. Buchanan, T.L. Peterson, I. Maartense and R.R. Biggers  
Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Tailoring the Cutoff Wavelength and Absorption in InAs/InGaSb Superlattices for Long Wavelength Infrared Detection"

E.R. Heller, F. Szmulowicz, and F.L. Madarasz  
Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"An Investigation of the Band Gap Properties of InAs/InGaSb Superlattices with Random Layer Widths"  
J.W. Thompson and F. Szmulowicz  
Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

(Invited) "Deep Levels in 6H-SiC as Studied by Admittance Spectroscopy Techniques"  
W.C. Mitchel, A.O. Evwaraye and S.R. Smith  
Wide BandGap Semiconductors and Device Symposium  
188th Electrochemical Soc. Mtg., Chicago, IL (8-13 Oct 1995)

"Characterization of a normal incidence p-doped GaAs/GaInP quantum well intersubband photodetector"  
J. Hoff, J. Piotrowski, E. Bigan, M. Razeghi and G.J. Brown  
Third International Symposium on Long wavelength Infrared Detectors and Arrays. Physics and Applications  
188th Electrochemical Soc. Mtg., Chicago, IL (8-13 Oct 1995)

"Liquid Encapsulated Growth of GaSe"  
N.B. Singh, N. Fernelius, F.K. Hopkins, A-X. Zhao and R. Narayanan  
6th Eastern Regional Conference of the American Association of Crystal Growth (ACCG/east-95),  
Atlantic City, NJ (15-18 Oct 1995)

"Gallium Selenide Crystals for Far-IR NLO Applications"  
N. Fernelius, F.K. Hopkins, N.B. Singh, T. Henningsen, V. Balakrishna and R. Narayanan  
International Symposium on Growth and Optical Properties of Compound Semiconductors,  
Dayton, OH (13-14 Nov 1995)

"MOVPE Growth of High Electron Mobility AlGaIn/GaN Heterostructures"  
J.M. Redwing, M.A. Tischler, S. Choi, W. Mitchel and A. Saxler  
Fall MRS Mtg., Boston, MA (Nov/Dec 1995)

"Electrical and Optical Properties of Defects in n-type 4H-SiC"  
A.O. Evwaraye, S.R. Smith and W.C. Mitchel  
Fall MRS Mtg., Boston, MA (Nov/Dec 1995)

"High Mobility AlGaIn/GaN 2DEG Structures Grown on SiC Substrates"  
J.M. Redwing, J.S. Flynn, M.A. Tischler and W.C. Mitchel  
Symposium E: III-V Nitride, SiC and Diamond Materials for Electronic Devices  
Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Impurity Conduction in n-type 4H-SiC"  
A.O. Evwaraye, S.R. Smith and W.C. Mitchel  
Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Thermal and Optical Admittance Spectroscopy studies of Defects in 15R-SiC"  
S.R. Smith, A.O. Evwaraye and W.C. Mitchel  
Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

(Invited) "SiC Devices for DoD Applications"  
L.S. Rea  
Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Electronic and Optical Investigation of the Position of Vanadium Impurities in the 4H and 6H SiC Bandgaps"  
J.R. Jenny, M. Skowronski, W.C. Mitchel, A.O. Evwaraye, S.R. Smith, H.M. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins  
Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

## **PUBLICATIONS**

### **FY96 Book**

Photodetectors: Materials and Devices, Eds. Gail J. Brown and Manijeh Razeghi,  
SPIE Proceedings **2685** (1996).

### **FY96 Refereed Journal Publications**

"Atomistic Calculations of Defects in  $\text{ZnGeP}_2$ "

P. Zapol, R. Pandey, M.C. Ohmer and J. Gale  
J. Appl. Phys. **79**, 671 (1996)

"Optical and Structural Characterization of Triallyl thiourea Cadmium Chloride (ATCC)"

Uma B. Ramabadran, Rama Vuppaladhadiam, D. Small, D.E. Zelmon and G.C. Kennedy  
Applied Optics **35**, 903 (1996)

"Electro-refraction and Electro-absorption in Poled Polymer Fabry-Perot Etalons"

N.F. O'Brien, V. Dominic and S.J. Caracci  
J. Appl. Phys. **79**, 7493 (1996)

"Growth and Characterization of Gallium Selenide Crystals for Far-infrared Conversion Applications"

N.B. Singh, T. Henningsen, V. Balakrishna, D.R. Suhre, N. Fernelius, F.K. Hopkins and D.E. Zelmon  
J. of Crystal Growth **163**, 398 (1996)

"Rubidium Titanyl Arsenate Difference Frequency Generation and Validation of New Sellmeier Coefficients"

D.L. Fenimore, K.L. Schepler, D. Zelmon, S. Kuck, U.B. Ramabadran, P. VonRichter and D. Small  
J. Opt. Soc. Amer. B **13**, 1 (1996)

"Optical Waveguiding and Morphology of Chitosan Thin Films"

H. Jiang, W. Su, S.J. Caracci, T.J. Bunning, T.M. Cooper and W.W. Adams  
J. Appl. Polym. Sci. **61**, 1163 (1996)

"Exciton/Biexciton Energies in Rectangular GaAs/AlGaAs Quantum Well Wires Including Finite Al-graded Band Offsets with Application to Third-order Optical Susceptibilities"

F.L. Madarasz, F. Szmulowicz and F.K. Hopkins  
Phys. Rev. B **52**, 8964 (1995)

"Conchoid of Nicomedes from Reflections and Refractions in a Cone"

F. Szmulowicz  
Am. J. Phys. **64**, 467 (1996)

"Analysis of Spectral Response in p-type GaAs/GaInP Quantum Well Infrared Photodetectors"

J. Hoff, C. Jelen, S. Slivken, E. Bigan, M. Razeghi and G. J. Brown  
Superlatt. Microstruct. **18**, 249 (1995).

"Optimization of Absorption in InAs/InGaSb Superlattices for Long Wavelength Infrared Detection"

F. Szmulowicz, E.R. Heller and K. Fisher  
Superlatt. Microstruct. **17**, 373 (1995)

"Response to 'Comment on Resonant Absorption and Photoresponse Measurement in p-type GaAs/AlGaAs Quantum Wells'"

F. Szmulowicz and G. J. Brown  
Appl. Phys. Lett. **67**, 3655 (1995)

"Effect of Barrier Material on the Two-Dimensional Electron Gas in  $\delta$ -doped GaInAs-based Quantum Wells"

I. Lo, W.C. Mitchel, P.W. Yu, A. Fathimulla and H. Hier  
Appl. Phys. Lett. **79**, 9196 (1996)

"Interface Roughness Scattering in Thin Quantum Wells"

S. Elhamri, M. Ahouija, R. Hudgins, D.B. Mast, R.S. Newrock, W.C. Mitchel, M. Razeghi and M. Erdtmann  
Superlattices and Microstructures **18**, 75 (1995)

"Persistent Photoconductivity Effect in  $\delta$ -doped AlInAs/GaInAs Heterostructures"

I. Lo, D.P. Wang, K.Y. Hsieh, T.F. Wang, W.C. Mitchel, M. Ahoujja, J.-P. Cheng, A. Fathimulla and H. Hier  
Phys. Rev. B **52**, 14671 (1995)

"The effect of Persistent Photoconductivity in Undoped GaInP/GaAs Quantum Wells"

M. Ahoujja, S. Elhamri, R.S. Newrock, D.B. Mast, W.C. Mitchel, Manijeh Razeghi and M. Erdtman  
Superlattices and Microstructures **18**, 147 (1995)

"AlGa<sub>N</sub> Ultraviolet Photoconductors Grown on Sapphire"

D. Walker, X. Zhang, P. Kung, A. Saxler, S. Javadvpour, J. Xu and M. Razeghi  
Appl. Phys. Lett. **68**, 2100 (1996)

"Two Dimensional Electron Gas Properties of AlGa<sub>N</sub>/Ga<sub>N</sub> Heterostructures Grown on 6H-SiC and Sapphire Substrates"

J.M. Redwing, M.A. Tischler, J.S. Flynn, S. Elhamri, M. Ahoujja, R.S. Newrock and W.C. Mitchel  
Appl. Phys. Lett. **69**, 963 (1996)

"Determination of the Band Offsets of the 4H-SiC/6H-SiC Heterojunction using the Vanadium Donor (0/+) Level as a Reference"

A. O. Evwaraye, S. R. Smith, and W. C. Mitchel  
Appl. Phys. Lett. **67**, 3319 (1995)

"Determination of the Activation Energy  $\epsilon_3$  for Impurity Conduction in n-type 4H-SiC"

A.O. Evwaraye, S.R. Smith, W.C. Mitchel and M.D. Roth  
Appl. Phys. Lett. **68**, 3159 (1996)

"High Field Effects in High Resistivity Silicon Carbide in Lateral Configurations"

T. S. Sudarshan, G. Gradinaru, G. Korony, W. Mitchel and R. H. Hopkins  
Appl. Phys. Lett. **67**, 3435 (1995)

"Time-of-flight Analysis of the Plume Dynamics of Laser-ablated 6H-Silicon Carbide"

M.A. Capano  
J. Appl. Phys. **78**, 4790 (1995)

"Electronic Properties of Boron in p-type Bulk 6H-SiC"

W.C. Mitchel, M.D. Roth, A.O. Evwaraye, P.W. Yu and S.R. Smith  
J. Electron. Matls. **25**, 863 (1996)

"Optical Admittance Studies of Vanadium Donor Level in High Resistivity p-type 6H-SiC,"

A. O. Evwaraye, S. R. Smith, and W. C. Mitchel  
J. Appl. Phys. **79**, 253 (1996)

"Temperature Dependence of the Barrier Height of Metal-semiconductor Contacts on 6H-SiC,"

S. R. Smith, A. O. Evwaraye and W. C. Mitchel  
J. Appl. Phys. **79**, 301 (1996)

"Shallow and Deep Levels in n-type 4H-SiC,"

A. O. Evwaraye, S. R. Smith, and W. C. Mitchel  
J. Appl. Phys. **79**, 7726 (1996)

✓ "Optical and Electrical Characterization of Boron Impurities in Silicon Carbide Grown by Physical Vapor Transport"

J. R. Jenny, M. Skowronski, W. C. Mitchel, H. M. Hobgood, R. C. Glass, G. Augustine and R. H. Hopkins  
J. Appl. Phys. **79**, 2326 (1996)

"Deep Level Transient Spectroscopic and Hall Effect Investigation of the Vanadium Acceptor Level in 4H and 6H SiC"

J.R. Jenny, M. Skowronski, W.C. Mitchel, H.M. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins  
Appl. Phys. Lett. **68**, 1963 (1996)

"High Field Activation of Micropipes in High Resistivity Silicon Carbide"  
T.S. Sudarshan, G. Gradinaru, G. Korony, W. Mitchel and R. Hopkins  
J. Electron. Matls. **25**, 893 (1996)

**FY96 Refereed Conference Proceedings**

"Investigation of Second Harmonic Generation in Glutamic Acid-Metal Complexes"  
T. M. Cooper, S. M. Cline, D. E. Zelmon, D. Tomlin, R. Vuppuladhadiam, S. Das Gupta, and U. Ramabadran  
Mat. Res. Soc. Symp. Proc. **417**, (1996)

"Electrical and Optical Properties of Defects in n-type 4H-SiC"  
A.O. Evwaraye, S.R. Smith and W.C. Mitchel  
Mat. Res. Soc. Symp. Proc. **410**, 57 (1996)

"Background Limited Performance in Aluminum-free p-doped Quantum Well Intersubband Photo-detectors"  
J. Hoff, J. Piotrowski, E. Bigan, M. Razeghi and G. J. Brown  
Proc. International Symp. on Compound Semiconductors, Inst. Phys. Conf. Ser. No. **145**, 1109 (1996)

"Background Limited Performance in p-Doped GaAs/Ga<sub>0.71</sub>In<sub>0.29</sub>As<sub>0.39</sub>P<sub>0.61</sub> Quantum Well Infrared Photodetectors"  
J. Hoff, C. Jelen, S. Slivken, M. Erdtmann, G. J. Brown, E. Bigan, and M. Razeghi  
Proceedings of the Third International Symposium on Long Wavelength Infrared Detectors and Arrays: Physics and Applications, ECS Proc. **95-28**, (1996)

"Characterization of a Normal Incidence p-doped GaAs/Ga<sub>0.51</sub>In<sub>0.49</sub>P Quantum Well Intersubband Photodetector"  
J. Hoff, J. Piotrowski, E. Bigan, M. Razeghi and G.J. Brown  
Proceedings of the Third International Symposium on Long Wavelength Infrared Detectors and Arrays: Physics and Applications, ECS Proc. **95-28**, (1996)

"Electronic and Nonlinear Optical Properties of Excitonic and Biexcitonic Structures in Rectangular GaAs/AlGaAs Quantum Well Wires"  
F.L. Madarasz, Frank Szmulowicz and F.K. Hopkins  
Proc. of the Third International Symposium on Quantum Confinement: Physics and Applications  
ECS Proc. **95-28**, (1996)

"Optical Absorption and Photoresponse in Fully Quaternary p-type Quantum Well Detectors"  
J. Hoff, C. Jelen, S. Slivken, G. J. Brown and M. Razeghi  
Photodetectors Materials and Devices, ed. G. J. Brown and M. Razeghi  
SPIE Proc. **2685**, 62 (1996).

"Determination of the Conduction Band Discontinuity in an n-type 3C-SiC/6H-SiC Heterojunction"  
S.R. Smith, A.O. Evwaraye, A.J. Steckl, C. Yuan, W.C. Mitchel and M.D. Roth  
Proc. 6th International Conf. on Silicon Carbide and Related Materials (1995), Kyoto, Japan  
Inst. Phys. Conf. Ser. **142**, 317 (1996)

"Electronic Properties of Semi-insulating Vanadium-doped 6H-SiC"  
W.C. Mitchel, M. Roth, A.O. Evwaraye, P.W. Yu, S.R. Smith, J. Jenny, M. Skowronski, H.McD. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins  
Proc. 6th International Conf. on Silicon Carbide and Related Materials (1995), Kyoto, Japan  
Inst. Phys. Conf. Ser. **142**, 313 (1996)

"Characterization of Boron in 6H-SiC Using Optical Absorption"  
P.W. Yu, K. Mahalingam, W.C. Mitchel, M.D. Roth and D.W. Fischer  
Inst. Phys. Conf. Ser. No **145**, 475 (1996)

"MOCVD Growth of Ga<sub>1-x</sub>In<sub>x</sub>As<sub>y</sub>P<sub>1-y</sub> - GaAs Quantum Well Structures"  
M. Razeghi, J. Hoff, M.Erdtmann, S. Kim, D. Wu, E. Kaas, C. Jelen, S. Slivken, I. Eliashevick, J. Diaz, E. Bigan, G. J. Brown and S. Javadpour  
Heterostructure Epitaxy and Devices, Eds. J. Novak & A. Schlachetzki, 229 (Kluwer Academic Publ., Netherlands, 1996)

"Observations on the Growth of YBaCuO Thin Films at Very High Laser Fluences"  
R.R. Biggers, M.G. Norton, I. Maartense, T.L. Peterson, E.K. Moser, D. Dempsey and J.L. Brown  
Film Synthesis and Growth Using Energetic Beams  
Mats. Res. Soc. Symposium Proc. **388**, 67 (1995)

#### **FY96 Non-Refereed Publications**

"Advances in Nonlinear Optical Crystals for Infrared Laser Sources"

F.K. Hopkins

Proceedings 1996 IRIS Specialty Group on Active Systems, Eglin AFB, FL (14-16 May 1996)

"Relationship of the Second Order Nonlinear Optical Coefficient to Bandgap in Inorganic Non-centrosymmetric Crystals"

A.G. Jackson, M. Ohmer, S.R. LeClair

Wright Laboratory Technical Report WL-TR-95-4098 (1995)

"Published Nonlinear Optical uses of Zinc Germanium Diphosphide"

Nils C. Fernelius

Wright Laboratory Technical Report WL-TR-96-4049 (1996)

"Directions in Air Force High-Temperature Power Electronics"

K.C. Reinhardt, J.D. Scofield and W.C. Mitchel

Wkshp. on High Temp Electronics for Vehicles, eds. G Khalil, H. Singh and T. Podlesak, p.73 (1996)

(US Army Technical Report, published by ARL/AMSRL-WT-NH, Fort Monmouth, NJ)

"Electronic Properties of Boron in p-type Bulk 6H-SiC"

W.C. Mitchel, M. Roth, A.O. Evwaraye, S.R. Smith, P.W. Yu, J. Jenny and M. Skowronski

Wkshp. on High Temp Electronics for Vehicles, eds. G Khalil, H. Singh and T. Podlesak, p.98 (1996)

(US Army Technical Report, published by ARL/AMSRL-WT-NH, Fort Monmouth, NJ)

#### **PRESENTATIONS (Chronological)**

"Photoluminescence Spectroscopy of CdGeAs<sub>2</sub>"

J.E. McCrae, R.L. Hengehold, Y.K. Yeo, M.C. Ohmer and P.G. Schunemann

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Wavelength Dependent Raman Scattering Studies in ZnGeP Single Crystals"

S. Tlali, H.E. Jackson and M.C. Ohmer

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Surface Morphology and Microwave Characterization of Pulsed-Laser Deposited YBaCuO Superconducting Thin Films"

E.K. Moser, R.R. Biggers, I. Maartense, T.L. Peterson, and J.L. Brown

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Optical Admittance Spectroscopy of 6H- and 4H SiC"

A.O. Evwaraye, S.R. Smith, and W.C. Mitchel

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Observed Transverse Voltage Characteristics of YBCO Superconducting Thin Films"

D.A. Buchanan, T.L. Peterson, I. Maartense and R.R. Biggers

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"Tailoring the Cutoff Wavelength and Absorption in InAs/InGaSb Superlattices for Long Wavelength Infrared Detection"

E.R. Heller, F. Szmulowicz, and F.L. Madarasz

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

"An Investigation of the Band Gap Properties of InAs/InGaSb Superlattices with Random Layer Widths"

J.W. Thompson and F. Szmulowicz

Fall Ohio Section Mtg. of APS, Dayton, OH (6-7 Oct 1995)

(Invited) "Deep Levels in 6H-SiC as Studied by Admittance Spectroscopy Techniques"

W.C. Mitchel, A.O. Ewaraye and S.R. Smith

Wide BandGap Semiconductors and Device Symposium

188th Electrochemical Soc. Mtg., Chigago, IL (8-13 Oct 1995)

"Characterization of a Normal Incidence p-doped GaAs/GaInP Quantum Well Intersubband Photodetector"

J. Hoff, J. Piotrowski, E. Bigan, M. Razeghi and G.J. Brown

Third International Symposium on Long wavelength Infrared Detectors and Arrays, Physics and Applications

188th Electrochemical Soc. Mtg., Chigago, IL (8-13 Oct 1995)

"Background Limited Performance in p-Doped GaAs/Ga<sub>0.71</sub>In<sub>0.29</sub>As<sub>0.39</sub>P<sub>0.61</sub> Quantum Well Infrared Photodetectors"

J. Hoff, C. Jelen, S. Slivken, M. Erdtmann, G. J. Brown, E. Bigan and M. Razeghi

Third International Symposium on Long wavelength Infrared Detectors and Arrays, Physics and Applications

188th Electrochemical Soc. Mtg., Chigago, IL (8-13 Oct 1995)

(Invited)"Electronic and Nonlinear Optical Properties of Excitonic and Biexcitonic Structures in Rectangular GaAs/AlGaAs Quantum Well Wires"

Frank L. Madarasz, Frank Szmulowicz and F. Kenneth Hopkins

Third International Symposium on Quantum Confinement: Physics and Applications

188th Electrochemical Soc. Mtg., Chigago, IL (8-13 Oct 1995)

"Liquid Encapsulated Growth of GaSe"

R. Narayanan, A-X. Zhao, N.B. Singh, N.C. Fernelius and F.K. Hopkins

6th Eastern Regional Conference of the American Association of Crystal Growth (ACCG/east-95),

Atlantic City, NJ (15-18 Oct 1995)

"MOCVD Growth of Ga<sub>1-x</sub>In<sub>x</sub>As<sub>y</sub>P<sub>1-y</sub> - GaAs Quantum Structures"

M. Razeghi, J. Hoff, M. Erdtmann, S. Kim, D. Wu, E. Kaas, C. Jelen, S. Slivken, I. Eliashavick, J. Diaz, E. Bigan, G. J. Brown and S. Javadpour

Second International Workshop on Heterostructure Epitaxy and Devices, Slovakia (16-19 Oct 95)

"Gallium Selenide Crystals for Far-IR NLO Applications"

N. Fernelius, F.K. Hopkins, N.B. Singh, T. Henningsen, V. Balakrishna and R. Narayanan

International Symposium on Growth and Optical Properties of Compound Semiconductors,

Dayton, OH (13-14 Nov 1995)

"Photoresponse Studies of the Polarization Dependence of the CdGeAs<sub>2</sub> Band Edge"

G. J. Brown, M. C. Ohmer and P. G. Schunemann

International Symposium on Growth and Optical Properties of Compound Semiconductors,

Dayton, OH (13-14 Nov 1995)

"MOVPE Growth of High Electron Mobility AlGaIn/GaN Heterostructures"

J.M. Redwing, M.A. Tischler, S. Choi, W. Mitchel and A. Saxler

Fall MRS Mtg., Boston, MA (Nov/Dec 1995)

"Electrical and Optical Properties of Defects in n-type 4H-SiC"

A.O. Ewaraye, S.R. Smith and W.C. Mitchel

Fall MRS Mtg., Boston, MA (Nov/Dec 1995)

"Solidification Behavior of Binary Organic NLO Crystals:m.NA-CNA and m.NA-p.NA Systems"

N.B. Singh, T. Henningsen, Namwar Singh, O.P. Singh, R.N. Singh, N.P. Singh, F.K. Hopkins, D.E. Zelmon and N.C. Fernelius

National Conf. on Fundamentals of Crystal Growth, Anna Univ., Madras, India (29-30 Jan 1995)

"Growth of Modified GaSe Crystals for Nonlinear Optical Applications"

N.B. Singh, D. Suhre, R. Narayanan, T. Henningsen, B. Balakrishna, D. Coffey, N.C. Fernelius, F.K. Hopkins and D.E. Zelmon

National Conf. on Fundamentals of Crystal Growth, Anna Univ., Madras, India (29-30 Jan 1996)

(Keynote Address)

"Investment in Infrared Technology, Past, Present and Future"

L.E. Brown

SPIE OE/LASE '96, Conference 2685: Photodetectors: Materials and Devices, (1-2 Feb 1996)

"Normal-incidence Long-wavelength Infrared GaAs/GaInAsP Quantum Well Infrared Photodetectors (QWIPs): Theory and Experiment

J. Hoff, M. Erdtmann, C. Jelen, S. Slivken, E. Bigan, M. Razeghi and G.J. Brown

SPIE OE/LASE '96, Conference 2685: Photodetectors: Materials and Devices, (1-2 Feb 1996)

"UV Photodetectors Based on AlGaIn grown by MOCVD"

A. Saxler, D. Walker, X. Zhang, P. Kung, J. Xu and M. Razeghi

SPIE OE/LASE '96, Conference 2685: Photodetectors: Materials and Devices, (1-2 Feb 1996)

"Multiple Subband Population in  $\delta$ -doped AlAsSb/InGaAs Heterostructures"

M. Ahoujja, S. Elhamri, R.S. Newrock, D.B. Mast, W.C. Mitchel and A. Fathimulla

Bull. Am. Phys. Soc. **41**, 418 (March 1996)

"EPR and ENDOR Study of  $Ti^{3+}$  Electron Traps in Hydrothermally grown  $KTiOPO_4$ "

S.D. Setzler, G.J. Edwards, M.P. Sripsick, L.E. Halliburton and N.C. Fernelius

Bull. Am. Phys. Soc. **41**, 140 (March 1996)

"Polarized Photoluminescence Study of  $CdGeAs_2$ "

J.E. McCrae, R.L. Hengehold, Y.K. Yeo, M.C. Ohmer and P.G. Schunemann

Bull. Am. Phys. Soc. **41**, (March 1996)

"Wavelength Dependent Raman Scattering Studies in  $ZnGeP_2$  Single Crystals"

S. Tlali, H. E. Jackson, M. C. Ohmer, P. G. Schunemann, T. M. Pollak

Bull. Am. Phys. Soc. **41**, (March 1996)

"Atomistic Calculations of Defects in  $ZnGeP_2$ "

P. Zapol, R. Pandey, M. Ohmer, J. Gale

Bull. Am. Phys. Soc. **41**, (March 1996)

(Invited) "Silicon Carbide (SiC) Semiconductor Applications- an Air Force Perspective"

L.S. Rea

Symposium E: III-Nitride, SiC and Diamond Materials for Electronic Devices

Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

Impurity Conduction in n-type 4H-SiC"

A.O. Evwaraye, S.R. Smith and W.C. Mitchel

Symposium E: III-Nitride, SiC and Diamond Materials for Electronic Devices

Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Thermal and Optical Admittance Spectroscopy Studies of Defects in 15R-SiC"

S.R. Smith, A.O. Evwaraye and W.C. Mitchel

Symposium E: III-Nitride, SiC and Diamond Materials for Electronic Devices

Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Electronic and Optical Investigation of the Position of Vanadium Impurities in the 4H and 6H SiC Bandgaps"

J.R. Jenny, M. Skowronski, W.C. Mitchel, A.O. Evwaraye, S.R. Smith, H.M. Hobgood, R.C. Glass, G. Augustine and R.H. Hopkins

Symposium E: III-Nitride, SiC and Diamond Materials for Electronic Devices

Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Properties of Laser Deposited Epitaxial YBCO Films on Unbuffered MgO and Vicinal cut  $LaAlO_3$ "

L.H. King and R.R. Biggers

Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

"Investigation of Second Harmonic Generation in Glutamic Acid-metal Complexes"

T.M. Cooper, S.M. Cline, D. E. Zelmon, D. Tomlin, R. Vuppuladhadiam, S. DasGupta and U. Ramabadran  
Spring MRS Mtg., San Francisco, CA (8-12 Apr 1996)

(Invited Award Presentation) "Nonlinear Crystal Technology for Improved Lasers"

F.K. Hopkins

Award Presented for *Excellence in Technology Transfer in 1996* for the development and transition of ZnGeP<sub>2</sub> by a team led by WL/MLPO scientists: Dr. M.C. Ohmer, Dr. F.K. Hopkins, Dr. David E. Zelmon, Dr. Nils Fernelius, David W. Fischer, Dr. Kenneth L. Schepler, Dale L. Fenimore, Dr. Margaret H. Ragdowsky, Walter Lauderdale, Dr. David Bliss, Dr. Peter J. Drevinsky, Dr. Yung Kee Yeo, Jack E. McCrae and Michael Greg  
Federal Laboratory Consortium National Technology Transfer Meeting, Seattle, WA (6-9 May 1996)

"Advances in Nonlinear Optical Crystals for Infrared Laser Sources"

F.K. Hopkins

1996 IRIS Specialty Group on Active Systems, Eglin AFB, FL (14-16 May 1996)

"Wavelength Tunable Midwave Infrared Generation"

M.C. Ohmer and P.J. Hood

'96 CLEO/QEL Conference, Anaheim, CA (4-6 June 1996)

"Bandgap Engineering with Ordered Ternary Semiconductors"

G.J. Brown and M.C. Ohmer

28th American Chemical Society Central Regional Mtg., Dayton, OH (9-12 June 1996)

"Investigation of Second Harmonic Generation in Zinc Glutamate"

S.M. Cline, D.E. Zelmon, T.M. Cooper, R. Vuppuladhadiam and S.C. Gupta

28th American Chemical Society Central Regional Mtg., Dayton, OH (9-12 June 1996)

"Hopping Conduction in n-type SiC"

W.C. Mitchel, A.O. Evwaraye, S.R. Smith and M. Roth

High Temperature Electronics Conference, Albuquerque, NM (9-14 June 1996)

"Temperature Effects on High Resistivity Silicon Carbide under Pulsed Electric Fields"

G. Gradinaru, G. Korony, T.S. Sudarshan, W.C. Mitchel and H.M. Hobgood

High Temperature Electronics Conference, Albuquerque, NM (9-14 June 1996)

"Theory of Second Harmonic Generation in Periodic Ferroelectric Materials"

D.S. Moroi and D.E. Zelmon

Proc. 16th Int. Liquid Crystal Conf., Kent State U., Kent, OH (24 June 1996)

"Impurity Conduction and Dopant Activation Energy in Highly Doped n-type Bulk SiC"

A.O. Evwaraye, S.R. Smith, W.C. Mitchel and M.D. Roth

38th Electronic Materials Conference, Santa Barbara, CA (26-28 June 1996)

"Two Dimensional Electron Gas Properties of AlGa<sub>N</sub>/Ga<sub>N</sub> Heterostructures grown by MOVPE on SiC and Sapphire Substrates"

J.M. Redwing, J.S. Flynn, M.A. Tischler, S. Elhamri, M. Ahoujja, R.S. Newrock, W.C. Mitchel and A. Saxler

38th Electronic Materials Conference, Santa Barbara, CA (26-28 June 1996)

"A novel Secular Equation for the Coupled-band Envelope-function Approximation for Superlattices and Application to InAs/InGaSb Superlattices"

F. Szmulowicz

9th Int. Conf. on Superlattices, Microstructures and Microdevices; Satellite Conf. to the 23rd ICPS, Liege, Belgium (14 July 1996)

"Aluminum Free Quantum Well Materials for LWIR Detection"

G. J. Brown, J. Hoff, C. Jelen, S. Slivken and M. Razeghi

IRIS Specialty Group on Infrared Materials, Boulder, CO (24 - 30 July 1996)

"Effects of Doping on NLO Coefficient of GaSe Crystals"

N. B. Singh, D. Shure, V. Balakrishna, R. Narayanan, A. X. Zhao, N. C. Fernelius and F. K. Hopkins  
The Ninth International Conference on Vapor Growth & Epitaxy, Vail, CO (4-9 Aug 1996)

(Invited) "Advances in Nonlinear Optical Crystals for Next-generation Laser Sources"

F.K. Hopkins

The Tenth American Conf. on Crystal Growth, Vail, CO (5 Aug 1996)

"Heuristic Rules for Group IV Dopant Site Selection in III-V Compounds"

R. Venkatasubramanian, D.L. Dorsey and K. Mahalingam

9th Int. Conf. on MBE, Malibu, CA (5-9 August 1996)

" $\text{YAlO}_3$ , a Promising Substrate for HTSC Thin Films and Microwave Applications"

J.S. Derov, A.J. Drehman, R.R. Biggers, B.A. Willemsen and S. Sridhar

Applied Superconductivity Conf., Pittsburgh, PA (25-30 Aug 1996)

"HTS-dielectric Resonators as a Microwave Characterization Tool"

E.K. Moser and K. Naishadham

Applied Superconductivity Conf., Pittsburgh, PA (25-30 Aug 1996)

"Spectral-component Monitoring for Measurement and Control of YBCO Laser Deposition Plumes"

R.R. Biggers, E.K. Moser, I. Maartense, T.L. Peterson, D. Dempsey, C. Varanasi, S. Murray, D. Lubbers, S. Laube, B. Lovett and P.T. Murray

Applied Superconductivity Conf., Pittsburgh, PA (25-30 Aug 1996)

## PUBLICATIONS

### FY97 Books/Thesis/Invited Publications & Presentations

(Book)

Photodetectors: Materials and Devices II, Eds. Gail J. Brown and Manijeh Razeghi  
SPIE Proceedings **2999** (1997)

(Book Chapter)

"Admittance spectroscopy of 6H, 4H and 15R silicon carbide,"  
S. R. Smith, A. O. Evwaraye, and W. C. Mitchel  
Silicon Carbide: A Review of Fundamental Questions and Applications to Current Device Technology,  
Vol II, eds. W.J. Choyke, H. Matsunami and G. Pensl (Akademie Verlag, Berlin, 1997), Page 227

(Ph.D. Thesis)

"Projector augmented wave method calculation of Ga adatom diffusion and local density of states for GaAs and Si surfaces"

Jeffrey G. LePage

Physics Department, The Ohio State University (1997)

(Special Issue of MRS Bulletin)

Silicon Carbide Electronic Materials and Devices, guest editors M.A. Capano and R.J. Trew  
MRS Bulletin **22**, No.3, Materials Research Soc., Pittsburgh, PA (March 1997)

(Special Issue of Physica Status Solidi)

"Admittance spectroscopy of 6H, 4H and 15R silicon carbide"

S.R. Smith, A.O. Evwaraye and W.C. Mitchel

Fundamental Questions and Applications of SiC

Physica Status Solidi(a) **162**, 227 (1997)

"Silicon Carbide (SiC) Semiconductor Applications- an Air Force Perspective"

L.S. Rea

III-Nitride, SiC and Diamond Materials for Electronic Devices

Mat. Res. Soc. Symp. Proc. **423**, 3 (1996)

"Characterization and modeling of GaAs/AlGaAs p-type multi-quantum wells for infrared detection at normal incidence"

G.J. Brown, W.T. Taferner, K.G. Eyink, S.M. Hegde, F. Szmulowicz and S.D. Walck

5th International Symp. on Long Wavelength IR Detectors and Arrays: Physics and Applications. Joint International Mtg. of ECS, Paris, France (31 Aug-5 Sep 1997)

"Spectral component monitoring and control of pulsed laser deposition of YBCO films"

R.R. Biggers, P.T. Murray, D. Mast, I. Maartense, T.L. Peterson, D. Dempsey, C. Varanasi, S. Murray, D. Lubbers, S. Laube, B. Lovett, E.K. Moser, J.L. Brown, D.C. Liptak and J. Busbee

Photonics West (SPIE), San Jose, CA (8-14 Feb 1997)

"Quantitative Modeling of MBE Growth - The Time is Now"

D.L. Dorsey

Workshop on Compound Semiconductor Materials and Devices

San Antonio, TX (16-18 Feb 1997)

"A Review of Ohmic Contacts to Gallium Nitride"

M.A. Capano

International Conference on Metallurgical Coatings and Thin Films, San Diego CA, April 1997

"A Detailed Atomic-Level Simulation of AlGaAs/GaAs (001) Heterointerface Formation"

D.L. Dorsey

U. Nevada - Las Vegas, Las Vegas, NV (12 Sept 1997)

"Emission Spectral-Component Monitoring for Measurement and Control of Pulsed Laser Deposited High Temperature Superconducting Thin Films"

R.R. Biggers

University of Dayton Physics Seminar, University of Dayton (Sep 1997)

"Optimizing the nonlinear semiconductors ZnGeP<sub>2</sub> and CdGeAs<sub>2</sub> for infrared laser applications"

M.C. Ohmer

American Vacuum Soc., OH Chapter 14th North Coast Symp., Cleveland, OH (5 June 1997)

"High Temperature Superconductivity at Wright Laboratory"

T.L. Peterson

Center for Materials Research Faculty Seminar Series, Ohio State University, Columbus, OH (Oct 1996)

"Band Gap Engineered Design of QW and SL Structures for Optimum Performance IR Detectors"

Frank Szmulowicz and Gail J. Brown

University of Alabama at Huntsville (May 22, 1997)

"Current status of nonlinear optical crystal development at USAF Materials Directorate"

N.C. Fernelius, F.K. Hopkins and S.J. Caracci

ACCGE/east-97: Eastern Regional Conf. on Cryst. Growth & Epitaxy, Atlantic City, NJ (28Sept-1 Oct 1997)

### **FY97 Refereed Journal Publications**

"Photoluminescence Study of p-type CdGeAs<sub>2</sub> Ordered Semiconductor Crystals"

J.E. McCrae, R.L. Hengehold, Y.K. Yeo, M.C. Ohmer and P.G. Schunemann

Appl. Phys. Lett. **70**, 455 (1997)

"Influences of temperature and transport properties on the birefringence of CdGeAs<sub>2</sub>"

D.W. Fischer, M.C. Ohmer and J.E. McCrae

J. Appl. Phys. **81**, 3579 (1997)

"Temperature Dependence of ZnGeP<sub>2</sub> Birefringence using Polarized Light Interference"

D.W. Fischer and M.C. Ohmer

J. Appl. Phys. **81**, 425 (1997)

"Relationship of the second order nonlinear optical coefficient to energygap in inorganic non-centrosymmetric crystals"

A.G. Jackson, M.C. Ohmer and S.R. LeClair

Infrared Physics & Technology **38**, 233 (1997)

"Theory of second harmonic generation in periodic ferroelectric materials"

D.S. Moroi and D.E. Zelmon

Mol. Cryst. Liq. Cryst. **299**, 97 (1997)

"Improved crystal quality and harmonic generation in GaSe doped with indium"

D.R. Suhre, N.B. Singh, V. Balakrishna, N.C. Fernelius and F.K. Hopkins

Optics Lett. **22**, 775 (1997)

"Infrared corrected Sellmeier coefficients for congruently grown lithium niobate and 5 mol% MgO doped LiNbO<sub>3</sub>"

D.E. Zelmon, D.L. Small and D. Jundt

J. Optical Soc. of America B14, (1997)

"Rough Sets Applied to Materials Data"

A.G. Jackson, S.R. LeClair, M.C. Ohmer, W. Ziarko and H. Al-Kamhwi

Acta Metallurgica et Materialia **44**, 4475 (1996)

"The origin of Ga desorption transients during AlGaAs/GaAs heterointerface formation by MBE"

K. Mahalingam, D.L. Dorsey, K.R. Evans and Rama Venkat

Appl. Phys. Lett. **70**, 3143 (1997)

"A Stochastic Model for Crystal-amorphous Transition in Low Temperature Molecular Beam Epitaxial Si(111)"

R. Venkatasubramanian, S. Gorantla, S. Muthuvenkatraman and D.L. Dorsey

J. Appl. Phys. **80**, 6219 (1996)

"Heuristic Rules for Group IV Dopant Site Selection in III-V Compounds"

R. Venkatasubramanian, D.L. Dorsey and K. Mahalingam

J. of Crystal Growth **175/176**, 224 (1997)

"A Monte Carlo Study of Gallium Desorption Kinetics during MBE of (100)-GaAs/AlGaAs Heterostructures"

K. Mahalingam, D.L. Dorsey, K.R. Evans and R. Venkatasubramanian

J. of Crystal Growth **175/176**, 211 (1997)

"Gallium desorption behavior at AlGaAs/GaAs heterointerfaces during high-temperature molecular beam epitaxy"

K. Mahalingam, D.L. Dorsey, K.R. Evans and Rama Venkat

J. Vacuum Sci. Technol. B **15**, 1159 (1997)

"Vertical exchange reaction in (Ga,In)As during migration-enhanced epitaxy"

S. Harris and D.L. Dorsey

J. Appl. Phys. **82**, 1 (1997)

"Influence of Physisorbed Arsenic on RHEED Intensity Oscillations during Low-Temperature GaAs Molecular Beam Epitaxy"

R. Venkatasubramanian, V. K. Pamula and D. L. Dorsey

Appl. Surf. Sci. **104/105**, 448 (1996)

"The Effect of the Spin Split-off Band on Optical Absorption in p-type  $\text{Ga}_{1-x}\text{In}_x\text{As}_y\text{P}_{1-y}$  QWIPs"  
J. R. Hoff, M. Razeghi and G. J. Brown  
Phys Rev **B54**, 10773 (1996)

"Aluminum free GaInP/GaAs quantum well infrared photodetectors for long wavelength detection"  
C. Jelen, S. Slivken, J. Hoff, M. Razeghi and G.J. Brown  
Appl. Phys. Lett. **70**, 360 (1997)

"Effect of Well Thickness on the Two-dimensional Electron-hole System in  $\text{Al}_x\text{Ga}_{1-x}\text{Sb/InAs}$  Quantum Wells"  
I. Lo, J-C Chiang, S-F Tsay, W. C. Mitchel, M. Ahoujja, R. Kaspi, S. Elhamri and R. S. Newrock  
Phys. Rev. B **55**, 13677 (1997)

"Multiple Subband Population in delta-doped AlAsSb/InGaAs heterostructures"  
M. Ahoujja, Said Elhamri, R.S. Newrock, D.B. Mast, W.C. Mitchel, Ikai Lo and A. Fathimulla  
J. Appl. Phys. **81**, 1609 (1997)

"Far-infrared magneto-optical study of two-dimensional electrons and holes in InAs/AlGaSb quantum wells"  
J. Kono, B.D. McCombe, J.-P. Cheng, I. Lo, W.C. Mitchel and C.E. Stutz  
Phys. Rev. B **55**, 1617 (1997)

"Electrical Properties of Undoped GaInP/GaAs Quantum Wells"  
S. Elhamri, M. Ahoujja, R.S. Newrock, D.B. Mast, S.T. Herbert, W.C. Mitchel and M. Razeghi  
Phys. Rev. B **54**, 10688 (1996)

"Two-dimensional electron gas in delta-doped double quantum wells for photo-detector application"  
Ikai Lo, Y.C. Chang, H.M. Weng, J.-C. Chiang and W.C. Mitchel  
J. Appl. Phys. **81**, 8112 (1997)

"Growth and characterization of InAs/GaSb photoconductors for long wavelength infrared range"  
H. Mohseni, E. Michel, Jan Sandoen, M. Razeghi, W.C. Mitchel and G.J. Brown  
Appl. Phys. Lett. **71**, 1403 (1997)

"High carrier lifetime InSb grown on GaAs substrates"  
E. Michel, H. Mohseni, J.D. Kim, J. Wojkowski, J. Sandven, J. Xu, M. Razeghi, R. Bredthauer, P. Vu, W. C. Mitchel and M. Ahoujja  
Appl. Phys. Lett. **71**, 1071 (1997)

"A Novel Secular Equation for the Coupled-band Envelope-function Approximation for Superlattices and Application to InAs/InGaSb Superlattices"  
F. Szmulowicz  
Superlattices and Microstructures **22**, 295 (1997)

"New eigenvalue Equation for the Kronig-Penney problem"  
Frank Szmulowicz  
Am. J. Phys. **65**(9), 1 (1997)

"Krönig-Penney model: a new solution"

Frank Szmulowicz

Eur. J. Phys. **18**, 1 (1997)

"Numerically-stable Hermitian Secular Equation for the Envelope-function Approximation for Superlattices"

Frank Szmulowicz

Phys. Rev. B **54**, 11539 (1996)

"A Comparison of the Critical Thickness for MBE Grown LT-GaAs Determined by in-situ Ellipsometry and Transmission Electron Microscopy"

K.G. Eyink, M.A. Capano, S.D. Walck, T.W. Haas and B.G. Streetman

J. Electr. Maters. **26**, 391-396 (1997)

"Hopping Conduction in Heavily Doped Bulk n-type SiC"

W.C. Mitchel, A.O. Evwaraye, S.R. Smith and M.D. Roth

J. Electron. Mat. **26**, 113 (1997)

"Electrical properties of high resistivity 6H-SiC under high temperature/high field stress"

G. Gradinaru, T.S. Sudarshan, S.A. Grandinaru, W.C. Mitchel and H.M. Hobgood

Appl. Phys. Lett. **70**, 735 (1997)

"High-resistance layers in n-type 4H-silicon carbide by hydrogen ion implantation"

Ravi K. Nadella and M.A. Capano

Appl. Phys. Lett. **70**, 886 (1997)

"Boron acceptor levels in 6H-SiC bulk samples"

A.O. Evwaraye, S.R. Smith, W.C. Mitchel and H.McD. Hobgood

Appl. Phys. Lett. **71**, 1186 (1997)

"Reply to 'Comment on 'Temperature dependence of the barrier height of metal-semiconductor contacts on 6H-SiC' "

S.R. Smith, A.O. Evwaraye and W.C. Mitchel"

J. Appl. Phys. **80**, 6572 (1996)

"Determination of the band-gap energy of AlInN grown by metal-organic chemical-vapor deposition"

K.S. Kim, A. Saxler, P. Kung, M. Razeghi and K.Y. Lim

Appl. Phys. Lett. **71**, 800 (1997)

"Optical properties of GaN grown on ZnO by reactive MBE"

F. Hamdani, A. Botchkarev, W. Kim, H. Morkoc, M. Yeadon, J.M. Gibson, S.-C.Y. Tsen, D.J. Smith, D.C.

Reynolds, D.C. Look, K. Evans, C.W. Litton, W.C. Mitchel and P.M. Hemenger

Appl. Phys. Lett. **70**, 467 (1997)

"Al<sub>x</sub>Ga<sub>1-x</sub>N (0≤x≤1) ultraviolet photodetectors grown on sapphire by metal-organic chemical-vapor deposition"

D. Walker, X. Zhang, A. Saxler, P. Kung, J. Xu and M. Razeghi

Appl. Phys. Lett. **70**, 949 (1997)

"Morphology of twinned GaN grown on (11•0) sapphire substrates"  
T. Kato, P. Kung, A. Saxler, C.J. Sun, H. Ohsato, M. Razeghi and T. Okuda  
Solid-State Electronics **41**, 227 (1997)

"Observation of room temperature surface-emitting stimulated emission from GaN:Ge by optical pumping"  
X. Zhang, P. Kung, A. Saxler, D. Walker and M. Razeghi  
J. Appl. Phys. **80**, 6544 (1996)

"Pulsed Laser Deposition of Titanium-Carbonitride Thin Films"  
M.A. Capano, A.A. Voevodin, J.E. Bultman and J.S. Zabinski  
Scripta Materialia **36**, 1101 (1997)

"Use of High Density  $Y_2BaCuO_5$  substrates in the melt processing of  $YBa_2Cu_3O_{7-x}$  bars with high transport critical current"  
G. Kozlowski, C. Varanasi, I. Maartense, C.E. Oberly  
Physica C **276**, 197 (1997)0

"Dielectric Resonators as a Microwave Characterization Tool"  
E. K. Moser and K. Naishadham  
IEEE Trans. on Applied Superconductivity **7**, 2018 (1997)

#### **FY97 Refereed Conference Proceedings**

"Inelastic Light Scattering in Zinc Germanium Diphosphide"  
B. H. Bairamov, A. Aydinli, Yu. V. Rud, V. K. Negoduyko, V. V. Toporov, H. Jackson, P. Shunemann, M. Ohmer and N. Fernelius  
Infrared Applications of Semiconductors-Materials, Processing and Devices  
Mat. Res. Soc. Symp. Proc. **450**, 309 (1997)

"Investigation of second harmonic generation in Glutamic Acid-Metal complexes"  
T.M. Cooper, S.M. Cline, D.E. Zelmon, R. Vuppaladhadiam, S.D. Gupta and U.B. Ramabadran  
Better Ceramics Through Chemistry VII, eds. B.K. Coltrain, C. Sánchez, D.W. Schaefer and G.L. Wilkes  
Mat. Res. Soc. Symp. Proc. **435**, 655 (1996)

"Very Long Wavelength GaAs/GaInP Quantum well infrared Photodetectors"  
C. Jelen, S.Slivken, G.J. Brown and M. Razeghi  
Photodetectors Materials and Devices II, Eds. G.J. Brown and M. Razeghi  
SPIE Proceedings **2999**, 144 (1997).

"Normal Incidence Photoresponse as a Function of Well Width in p-type GaAs/AlGaAs Multi-quantum Wells"  
G.J. Brown, K. Eyink, M. Capano, S.M. Hegde and F. Szmulowicz  
Infrared Applications of Semiconductors-Materials, Processing and Devices  
Mat. Res. Soc. Symp. Proc. **450**, 231 (1997)

"GaAs/GaInP quantum well intersubband photodetectors for focal plane array infrared imaging"  
C. Jelen, S. Slivken, G.J. Brown and M. Razeghi  
Mat. Res. Soc. Symp. Proc. **450**, 195 (1997)

"InSb detectors and focal plane arrays on GaAs, Si and Al<sub>2</sub>O<sub>3</sub> substrates"

E. Michel, H. Mohseni, J. Wojkowski, J. Sandven, J. Xu, M. Razeghi, P. Vu, R. Bredthauer, W.C. Mitchel and M. Ahoujja

Infrared Applications of Semiconductors - Materials, Processing and Devices

Mat. Res. Soc. Symp. Proc. **450**, 79 (1997)

"Silicon Carbide (SiC) Semiconductor Applications- an Air Force Perspective"

L.S. Rea

III-Nitride, SiC and Diamond Materials for Electronic Devices

Mat. Res. Soc. Symp. Proc. **423**, 3 (1996)

"Impurity conduction in n-type 4H-SiC"

"A.O. Evwaraye, S.R. Smith, W.C. Mitchel and M.D. Roth

Symposium: III-Nitride, SiC and Diamond Materials for Electronic Devices

Mat. Res. Soc. Symp. Proc. **423**, 637 (1996)

"Thermal and optical admittance spectroscopy studies of defects in 15R-SiC"

S.R. Smith, A.O. Evwaraye and W.C. Mitchel

Symposium: III-Nitride, SiC and Diamond Materials for Electronic Devices

Mat. Res. Soc. Symp. Proc. **423**, 705 (1996)

"Electrical and optical investigation of the position of vanadium related defects in the 4H and 6H SiC bandgaps"

J.R. Jenny, M. Skowronski, W.C. Mitchel, S.R. Smith, A.O. Evwaraye, H.M. Hobgood, G. Augustine and R.H. Hopkins

Symposium: III-Nitride, SiC and Diamond Materials for Electronic Devices

Mat. Res. Soc. Symp. Proc. **423**, 507 (1996)

"Electro-optical investigation of micropipes in SiC"

T.S. Sudarshan, H. Moshen, G. Gradinaru, G. Korony and W.C. Mitchel

Symposium: E

MRS Fall Mtg., Boston, MA (2-6 Dec 1996) (in-press)

"Structural and microstructural characterization of GaN thin films and GaN-based heterostructures grown on sapphire substrates "

M. Razeghi, A. Saxler, P. Kung, X. Zhang, D. Walker, K.Y. Lim and K.S. Kim

J. Korean Phys. Soc. (Proc. Suppl.) **30**, S1 (1997)

"High resolution x-ray diffraction of GaN grown on sapphire substrates"

A. Saxler, M.A. Capano, W.C. Mitchel, P. Kung, X. Zhang, D. Walker and M. Razeghi

III-V Nitrides

Mat. Res. Soc. Symp. Proc. **449**, 477 (1997)

"AlGaN based materials and heterostructures"

P. Kung, A. Saxler, D. Walker, X. Zhang, R. Lavado, K.S. Kim and M. Razeghi

III-V Nitrides

Mat. Res. Soc. Symp. Proc. **449**, 79 (1997)

"Intrinsic  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  photodetectors for the entire compositional range"  
D. Walker, X. Zhang, A. Saxler, P. Kung, J. Xu and M. Razeghi  
Photodetectors: Materials and Devices II, eds. G.J. Brown and M. Razeghi  
SPIE Proceedings **2999**, 267 (1997)

"Recent advances in III-Nitride materials, characterization and device applications"  
M. Razeghi, X. Zhang, P. Kung, A. Saxler, D. Walker, K. Y. Lim, and K. S. Kim  
Solid State Crystals in Optoelectronics and Semiconductor Technology, ed. A. Rogalski, J. Rutkowski, A. Majchrowski, and J. Zielinski  
SPIE Proceedings **3179**, 2 (1996)

"Spectral-Component Monitoring and Control of Pulsed Laser Deposition of YBCO Films"  
R.R. Biggers, P.T. Murray, D. Mast, I. Maartense, T.L. Peterson, D. Dempsey, C. Varanasi, S. Murray, D. Lubbers, S. Laube, B. Lovett, E.K. Moser, J.L. Brown, D.C. Liptak and J. Busbee  
Photodetectors: Materials and Devices II, Eds. Gail J. Brown and Manijeh Razeghi  
SPIE Proceedings **2999**, 371 (1997)

#### **FY97 Non-Refereed Publications**

"Bibliography on KTP isomorphs"  
Nils C. Fernelius  
Wright Lab Technical Rpt., WL-TR-96-4121

"Nonlinear Optical Materials for Frequency Conversion and Optical Signal Processing"  
S.J. Caracci, N.C. Fernelius, M.C. Ohmer and D.E. Zelmon  
Proc. Sixth Annual Phillips Laboratory Technical Interchange Symposium **Vol 2**, 577 (1997)  
Kirtland Air Force Base, Albuquerque, NM (16 July 1997)

"Resistivity of FeCoTa high strength laminates from -73C to +650C"  
G.K. Simon, R.E. Perrin, M.C. Ohmer, T.L. Peterson and C.E. Culp  
Wright Lab Technical Rpt., WL-TR-97-4047

"Resistivity of FeCoV high strength laminates from -73C to +650C"  
G.K. Simon, R.E. Perrin, M.C. Ohmer and T.L. Peterson  
Wright Lab Technical Rpt., WL-TR-97-4006

"Supersonic rain damage threshold velocities using laminated diamond structures"  
E. Kelly, R. Ondercin, W. Cashion, F. Hagedorn, A. Harker, L. Goldman and J. Detrio  
Proc. Mtg. IRIS Specialty Group on Infrared Materials, Boulder, CO (1996)

"Environmental testing of long wave infrared (LWIR) windows"  
E.S. Kelly, R.J. Ondercin, J.A. Detrio and P.R. Greason  
Proc. SPIE 11th Aerosense Conf on Window and Dome Technologies and Matls, Orlando, FL (1997)

"Diamond coated ZnS for improved erosion resistance"  
R. Korenstein, L. Goldman, R. Hallock, R. Ondercin and E. Kelly  
Proc. SPIE 11th Aerosense Conf on Window and Dome Technologies and Matls, Orlando, FL (1997)

Book Review by F.K. Hopkins  
Handbook of Nonlinear Optics, Marcel Dekker, Inc. New York, NY (1996)  
Optical Engineering **36**, 964 (1997)

**FY97 Accepted for Publication**

"Influence of Host Environment on the Poling Characteristics and Chromophore-Chromophore Interactions in Electro-Optic Guest-Host Polymer Systems"

M. D. Alexander Jr., R. A. Vaia, M. Banach, S. J. Caracci, B. Reinhardt and R. Spry  
Proceedings MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Nonlinear optical frequency conversion materials for multi-band remote sensing and surveillance"

S. Caracci, N. Fernelius, M. Ohmer and D. Zelmon

Proceedings AGARD 7th Symp. on Multi-Sensor Systems and Data Fusion for Telecommunications, Remote Sensing and Radar, Lisbon, Portugal (29 Sep-2 Oct 1997)

"Dependence of nonlinear absorption in CdGeAs<sub>2</sub> on temperature, orientation and charge carrier density"

S. Guha, M.C. Ohmer and P.J. Hood and P.G. Schunemann

CLEO/QELS, Baltimore, MD (18-23 May 1997)

"What drives non linear optics R&D"

F.K. Hopkins

Optics & Photonics News, Publ. by the Optical Soc. of America

"Laser damage studies of silver gallium sulfide single crystals"

W. Ruderman, J. Maffetone and D.E. Zelmon

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Refractive index measurements of barium titanate from 0.4 to 5.0 microns and implications for periodically poled frequency conversion devices"

D.E. Zelmon, D.L. Small and P. Schunemann

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Operational characteristics of GaSe crystals for mid-IR and far-IR applications"

N.C. Fernelius, F.K. Hopkins, N.B. Singh, D. Suhre, M. Marable, R.H. Hopkins, R. Meyer and P. Mui

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Atomistic calculations of dopant binding energies in ZnGeP<sub>2</sub>"

R. Pandey, M.C. Ohmer, A. Costales and J.M. Recio

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Frequency doubling of CW and pulsed CO<sub>2</sub> lasers using diffusion-bonded, quasi-phase-matched GaAs stacks"

Infrared Applications of Semiconductors II

M.C. Ohmer, S. Guha, R.E. Perrin, L.S. Rea, P.W. Yu and A. Fathimulla  
Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Photoresponse studies of the polarization dependence of the cadmium germanium arsenide band edge"

G.J. Brown, M.C. Ohmer and P.G. Schunemann

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Characterization of CdGeAs<sub>2</sub> using capacitance methods"

S.R. Smith, A.O. Evwaraye and M.C. Ohmer

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"A Comprehensive Atomic-Level Simulator for AlGaAs/GaAs (001) MBE"

D.L. Dorsey, K. Mahalingam and R. Venkat

Proceedings of Int. Symp. Comp. Semiconductors-24, San Diego, (8-11 Sept 1997)

"Mid-IR photodetectors based on InAs/InGaSb type-II quantum wells"

G.J. Brown, M. Ahoujja, F. Szmulowicz, W.C. Mitchel and C.H. Lin

Infrared Applications of Semiconductors II

Proc. MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Characterization and modeling of GaAs/AlGaAs p-type multi-quantum wells for infrared detection at normal incidence"

G.J. Brown, W.T. Taerner, K.G. Eyink, S.M. Hegde, F. Szmulowicz and S.D. Walck

5th International Symp. on Long Wavelength IR Detectors and Arrays: Physics and Applications. Joint ECS Proceedings 97- , (1998)

"Pixelless infrared imaging using quantum wells"

G.J. Brown and F. Szmulowicz

Proceedings AGARD 7th Symp. on Multi-Sensor Systems and Data Fusion for Telecommunications, Remote Sensing and Radar, Lisbon, Portugal (29 Sep-2 Oct 1997)

"Calculation and photoresponse measurement of the long-wavelength IR absorption in p-type GaAs/AlGaAs quantum wells and type-II InAs/InGaSb superlattices"

F. Szmulowicz, G.J. Brown, W.C. Mitchel, H.C. Liu, L. Li, M. Buchanan, Z.R. Wasilewski and C.H. Lin  
Proceedings International Workshop on Intersubband Transitions in Quantum Wells: Physics and Devices, Tainan, Taiwan (15-18 Dec 97)

"Thermal activation energies for the three in-equivalent lattice sites for the B<sub>si</sub> acceptor in 6H-SiC"

A.O. Evwaraye, S.R. Smith, W.C. Mitchel and H. McD. Hobgood

Proc. International Conf. on Defects in Semiconductors, Aveiro, Portugal (21-25 July 97)

"High Voltage Lateral DMOSFETs in 4H-SiC"

J. Spitz, M.R. Melloch, J.A. Cooper, Jr. and M.A. Capano  
Inst. Phys. Conf. Ser. (in press)

"Structural Characterization of SiC Crystals Grown by Physical Vapor Transport"

E. Sanchez, V.D. Heydemann, G.S. Rohrer, M. Skowronski, J. Solomon, M.A. Capano and W.C. Mitchel  
Inst. Phys. Conf. Ser. (in press)

"Minority Carrier Lifetime Measurements in 6H-SiC Using the Photoconductive Decay Technique"

W. Zhou, I. Khlebnikov, T.S. Sudarshan, M.A. Capano and W.C. Mitchel, '  
Inst. Phys. Conf. Ser. (in press)

"Lateral DMOSFETs in 4H-SiC with High Blocking Voltage"

J. Spitz, M.R. Melloch, J.A. Cooper, Jr. and M.A. Capano  
IEEE Electr. Dev. Lett. (in press)

"2.6 kV Lateral DMOSFETs"

J. Spitz, M.R. Melloch, J.A. Cooper, Jr. and M.A. Capano  
IEEE Electr. Dev. (in press)

"AlGaN/GaN Heterostructures: Effective Mass and Scattering Times"

S. Elhamri, M. Ahoujja, R.S. Newrock, D.B. Mast, J.M. Redwing, M.A. Tischler, J.S. Flynn and W.C. Mitchel  
Phys. Rev. B

"Comparison of trimethylgallium and triethylgallium for the growth of GaN"

A. Saxler, D. Walker, P. Kung, X. Zhang, M. Razeghi, J. Solomon, W. C. Mitchel, and H. R. Vydyanath,  
Appl. Phys. Lett. (Manuscript # L-2133 received 6/9/97)

"MOCVD Growth of High Quality GaN-AlGaN Based Structures on Al<sub>2</sub>O<sub>3</sub> Substrates with Dislocation Density less than 10<sup>7</sup> cm<sup>-2</sup>"

P. Kung, X. Zhang, A. Saxler, D. Walker, M. Razeghi, W. Qian, and V. P. Dravid  
J. European Ceram. Soc., (1997).

"Spectral component monitoring of the plumes generated during deposition of Re(Y,Nd)BaCuO films by pulsed laser ablation"

R. Biggers, C. Varanasi, I. Maartense, D. Dempsey, D. Mast, D. Liptak, J. Jones, T.L. Peterson, T. Murray and J. Busbee

In Situ Process Diagnostics and Intelligent Materials Processing  
Mat. Res. Soc. Symp. Proc. **502**, (1998)

"Raman spectroscopy for determining YBCO thin film parameters *in situ*"

J.D. Busbee, D.P. Lubbers, A.G. Jackson, R.R. Biggers, D.C. Liptak and I. Maartense  
Proc: Applications of Sensors in Materials Processing  
TMS Annual Mtg, Orlando, FL (Feb 1997)

### **FY96 ACCEPTED LIST BELOW**

"MOVPE Growth of High Electron Mobility AlGa<sub>N</sub>/Ga<sub>N</sub> Heterostructures"  
J.M. Redwing, M.A. Tischler, S. Choi, W. Mitchel and A. Saxler  
Proc. Fall MRS Mtg., Boston, MA (Nov/Dec 1995)

### **FY97 Submitted for Publication**

"SHG experiments in GaSe single crystal"

M. Marble, R. Jones, N.B. Singh, V. Balakrishna and N.C. Fernelius  
Appl. Optics (Jan 97)

"Bridgman growth of GaSe crystals for nonlinear optical applications"

N.B. Singh, R. Narayanan, A.X. Zhao, V. Balakrishna, D.R. Suhre, N.C. Fernelius and D.E. Zelmon"  
J. Matls. Sci. & Eng. (Jan 97)

"A theoretical study of native defects in CdGeAs<sub>2</sub>"

R. Pandey, M.C. Ohmer and J.D. Gale  
J. Appl. Phys. (20 June 1997)

"Refractive index measurements of undoped yttrium aluminum garnet from 0.4 to 5.0 microns"

Dr.E. Zelmon and D.L. Small  
Appl. Optics (15 Oct 97)

"Ab-initio calculation of binding and diffusion of a Ga adatom on the GaAs (001)-c(4x4) surface"

J.G. LePage, M. Alouani, J.W. Wilkins and P.E. Blöchl  
Phys. Rev.B (clearance 28Aug97)

"Theoretical study of antisite arsenic incorporation in the low temperature MBE"

S. Muthuvenkatraman, S. Gorantla, R. Venkat and D.L. Dorsey  
J. Appl. Phys. (Apr 97)

"Antisite arsenic incorporation in the low temperature MBE of gallium arsenide: Physics and modeling"

S. Muthuvenkatraman, S. Gorantla, R. Venkat and D.L. Dorsey  
J. Electron. Matl. (July 97)

"A study of GaAs/AlGaAs p-type quantum well infrared photodetectors with varying barrier heights"

H.C. Liu, L. Li, M. Buchanan, Z.R. Wasilewski, G.J. Brown, F. Szmulowicz and S.M. Hegde  
J. Appl. Phys. (Jan 97)

"Observation of a negative persistent photoconductivity effect in ZnSSe/ZnCdSe quantum wells"

I. Lo, S.J. Chen, Y.C. Lee, L-W. Tu, W.C. Mitchel, M. Ahoujja, R.E. Perrin, R.C. Tu, Y.K. Su, W.H. Lan and S.L. Tu  
Appl. Phys. Lett. (clearance 29 Aug 97)

"Noise Performance of InGaAs/InP Quantum well Infrared Photodetectors"

C. Jelen, S. Slivken, T. David, M. Razeghi and G.J. Brown  
Appl. Phys. Lett. (submitted Aug. 1997).

"Numerically-stable secular equation for superlattices via transfer matrix formalism"

Frank Szmulowicz

Phys. Rev. B (1997, in review).

"Determination of the phonon spectrum of 6H-SiC from the measurement of interband transitions by optical admittance spectroscopy"

S.R. Smith, A.O. Evwaraye and W.C. Mitchel

J. Appl. Phys.

"Time-Dependent Characteristics of Titanium-Silicide Contacts to 6H-Silicon Carbide"

M.A. Capano, J.K. Patterson, L. Petry and J.S. Solomon

J. Appl. Phys.

"Sulfur doping of GaN grown by metalorganic chemical vapor deposition"

A. Saxler, P. Kung, X. Zhang, D. Walker, M. Razeghi, J. Solomon, M. Ahoujja and W.C. Mitchel

Appl. Phys. Lett. (2 Jul 1997)

"The effect of secondary oxygen annealing on the superconductive properties of 2223-Tl-Ba-Ca-Cu-O thin films"

I. Maartense, T.L. Peterson, W.L. Holstein and L.A. Parisi

J. Matls. Res. (Aug 97)

"YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> / Ag Thick Films Deposited by Pulsed Laser Ablation"

C. Varanasi, R. Biggers, I. Maartense, T.L. Peterson, J. Solomon, E.K. Moser, D. Dempsey, G. Kozłowski, R. Nekkanti, and C.E. Oberly

Physica C

"Emission Spectral-Component Monitoring and Fuzzy Logic: Self-Directed Control of Pulsed Laser Deposition"

R.R. Biggers, J.G. Jones, I. Maartense, T.L. Peterson, J.D. Busbee, D. Dempsey, D. Liptak, C. Varanasi, D. Mast, D. Lubbers

Engineering Applications of Artificial Intelligence

"In situ time-resolved measurements of Cu\* Emission during pulsed laser deposition of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-d</sub>: emission dependence on substrate heater temperature"

R. Biggers, I. Maartense, D. Lubbers, S. Laube, S. Murray, D. Dempsey, T.L. Peterson, P.T. Murray, D.B. Mast

Superconductor Science and Technology

#### **FY96 SUBMITTED LIST BELOW**

"Reflections and Refractions in a Cone: Conchoid of Nicomedes"

Frank Szmulowicz

Mathematics Magazine

## **PRESENTATIONS (Chronological)**

### **Submitted/Presented in FY97**

"Development of III-Nitride Technology for Optoelectronic Devices"

M. Razeghi and A. Saxler

DARPA/ETO 1996 Optoelectronics Program Reviews: Optical Interconnects/Free Space Optical Interconnects & Short Wavelength Technology, Orlando, FL (7-10 Oct 1996)

"Recent advances in III-Nitride materials, characterization and device applications"

M. Razeghi, X. Zhang, P. Kung, A. Saxler, D. Walker, K.Y. Lim and K.S. Kim

XII Conference on Solid State Physics-Materials Science and Applications

Organized by the Institute of Applied Physics, WAT

Zakopane, Poland (7-12 Oct 1996)

"Structural and microstructural characterization of GaN thin films and GaN-based heterostructures grown on sapphire substrates "

M. Razeghi, A. Saxler, P. Kung, X. Zhang, D. Walker, K.Y. Lim and K.S. Kim

The 8th Seoul International Symposium on the Physics of Semiconductors and Applications - 1996 (ISPSA '96), organized by the Korean Physical Society, KIST, Seoul, Korea (21-22 Oct 96).

"High Temperature Superconductivity at Wright Laboratory"

T.L. Peterson

Center for Materials Research Faculty Seminar Series, Ohio State University, Columbus, OH (Oct 1996)

"Inelastic Light Scattering in Zinc Germanium Diphosphide"

B. H. Bairamov, A. Aydinli, Yu. V. Rud, V. K. Negoduyko, V. V. Toporov, H. Jackson, P. Shunemann, M. Ohmer and N. Fernelius

Symposium O: Infrared Applications of Semiconductors - Materials, Processing and Devices

MRS Fall Mtg. Boston, MA (2-6 Dec 1996)

"First principles calculations of electronic structure of CdGeAs<sub>2</sub>"

P. Zapol, R. Pandey and M.C. Ohmer

Symposium O: Infrared Applications of Semiconductors - Materials, Processing and Devices

MRS Fall Mtg. Boston, MA (2-6 Dec 1996)

"Normal Incidence Photoresponse as a Function of Well Width in p-type GaAs/AlGaAs Multi-quantum Wells"

G.J. Brown, K. Eyink, M. Capano, S.M. Hegde and F. Szmulowicz

Symposium O: Infrared Applications of Semiconductors-Materials, Processing and Devices

MRS Fall Mtg. Boston, MA (2-6 Dec 1996)

"GaAs/GaInP quantum well intersubband photodetectors for focal plane array infrared imaging"

C. Jelen, S. Slivken, G.J. Brown and M. Razeghi

Symposium: Infrared Applications of Semiconductors - Materials, Processing and Devices

MRS Fall Mtg. Boston, MA (2-6 Dec 1996)

"InSb detectors and focal plane arrays on GaAs, Si and Al<sub>2</sub>O<sub>3</sub> substrates"

E. Michel, H. Mohseni, J. Wojkowski, J. Sandven, J. Xu, M. Razeghi, P. Vu, R. Bredthauer, W.C. Mitchel and M. Ahoujja

Symposium: Infrared Applications of Semiconductors - Materials, Processing and Devices

MRS Fall Mtg. Boston, MA (2-6 Dec 1996)

"Titanium Thin Films on 6H-SiC: The Influence of Carbon on the Reaction of Ti with Silicon Carbide"

M.A. Capano, J.K. Patterson, J.S. Solomon and S.D. Walck

MRS Fall Mtg. Boston, MA (2-6 Dec 1996)

"Electro-optical investigation of micropipes in SiC"

T.S. Sudarshan, H. Moshen, G. Gradinaru, G. Korony and W.C. Mitchel

Symposium: E

MRS Fall Mtg., Boston, MA (2-6 Dec 1996)

"High resolution x-ray diffraction of GaN grown on sapphire substrates"

A. Saxler, M.A. Capano, W.C. Mitchel, P. Kung, X. Zhang, D. Walker and M. Razeghi

Symposium: N- III-V Nitrides

MRS Fall Mtg., Boston, MA (2-6 Dec 1996)

"AlGaIn based materials and heterostructures"

P. Kung, A. Saxler, D. Walker, X. Zhang, R. Lavado, K.S. Kim and M. Razeghi

Symposium: N- III-V Nitrides

MRS Fall Mtg., Boston, MA (2-6 Dec 1996)

"Gallium desorption behavior at AlGaAs/GaAs heterointerfaces during high-temperature molecular beam epitaxy"

K. Mahalingam, D.L. Dorsey, K.R. Evans and Rama Venkat

24th Conf. on Phys. & Chem of Semiconductor Interfaces, Research Triangle Park, NC (12-15 Jan 97)

"Characterization of Low Temperature Grown AlSb and GaSb Buffer Layers"

M. L. Seaford, T. W. Haas, D. H. Tomich, K. G. Eyink, W. V. Lampert, S. D. Walck, W. C. Mitchel, and L. F. Eastman

24th Conf. on Phys. & Chem of Semiconductor Interfaces, Research Triangle Park, NC (12-15 Jan 97)

"Very Long Wavelength GaAs/GaInP Quantum well infrared Photodetectors"

C. Jelen, S. Slivken, G.J. Brown and M. Razeghi

Photodetectors: Materials and Devices II, eds. G.J. Brown and M. Razeghi

Photonics West (SPIE), San Jose, CA (8-14 Feb 1997)

"Intrinsic Al<sub>x</sub>Ga<sub>1-x</sub>N photodetectors for the entire compositional range"

D. Walker, X. Zhang, A. Saxler, P. Kung, J. Xu and M. Razeghi

Photodetectors: Materials and Devices II, eds. G.J. Brown and M. Razeghi

Photonics West (SPIE), San Jose, CA (8-14 Feb 1997)

"Spectral component monitoring and control of pulsed laser deposition of YBCO films"

R.R. Biggers, P.T. Murray, D. Mast, I. Maartense, T.L. Peterson, D. Dempsey, C. Varanasi, S. Murray, D. Lubbers, S. Laube, B. Lovett, E.K. Moser, J.L. Brown, D.C. Liptak and J. Busbee  
Photonics West (SPIE), San Jose, CA (8-14 Feb 1997)

"Quantitative Modeling of MBE Growth - The Time is Now"

D.L. Dorsey

Workshop on Compound Semiconductor Materials and Devices  
San Antonio, TX (16-18 Feb 1997)

"Raman spectroscopy for determining YBCO thin film parameters *in situ*"

J.D. Busbee, D.P. Lubbers, A.G. Jackson, R.R. Biggers, D.C. Liptak and I. Maartense  
Symposium: Applications of Sensors in Materials Processing  
TMS Annual Mtg, Orlando, FL (Feb 1997)

"Heteroepitaxial AlGaIn films for ultraviolet photodetector applications"

A. Saxler, P. Kung, D. Walker, X. Zhang and M. Razeghi

4th Wide Bandgap and Nitride Workshop, St. Louis, MO (11-14 March 1997)

"Calculation of Ga adatom diffusion on GaAs (001)-c(4x4)"

J.G. LePage, M. Alouani, J.W. Wilkins and P.E. Blöchl

Am. Phys. Soc. March Mtg., Kansas City, MO (17-21 Mar 1997)

"Numerically-stable Hermitian secular equation for the envelope-function approximation for superlattices"

F. Szmulowicz

Am. Phys. Soc. March Mtg., Kansas City, MO (17-21 Mar 1997)

"Photoluminescence investigation of p-type GaAs/AlGaAs quantum well infrared detectors (QWIPs) designed for normal incidence detection in the 10 micron region"

S.M. Hegde, G.J. Brown, M.A. Capano and K. Eyink

Am. Phys. Soc. March Mtg., Kansas City, MO (17-21 Mar 1997)

"AlGaIn/GaN heterostructures: effective mass"

M. Ahoujja, S. Elhamri, R.S. Newrock, D.B. Mast, W.C. Mitchel, J.M. Redwing, M.A. Tschler and J.S. Flynn

Am. Phys. Soc. March Mtg., Kansas City, MO (17-21 Mar 1997)

"2-20 micron NLO materials"

N.C. Fernelius

Laser Standoff (Remote) Detection Team Meeting, Edgewood RD&E Center, Aberdeen Proving Ground, MD (2 April 1997)

"Silicon Carbide (SiC) Semiconductor Applications- an Air Force Perspective"

L.S. Rea

III-Nitride, SiC and Diamond Materials for Electronic Devices

MRS Spring Mtg., San Francisco, CA (8-12 April 1997)

"Thermal and optical admittance spectroscopy studies of defects in 15R-SiC"

S.R. Smith, A.O. Evwaraye and W.C. Mitchel

Symposium: III-Nitride, SiC and Diamond Materials for Electronic Devices

MRS Spring Mtg., San Francisco, CA (8-12 April 1997)

"Impurity Conduction in n-type 4H-SiC as a Function of the Shallow Dopant Density"

S. R. Smith, A. O. Evwaraye and W. C. Mitchel

Symposium: Defects in Electronic Materials

MRS Spring Mtg., San Francisco, CA (8-12 April 1997)

"Pulsed laser deposition of YBaCuO thick films with Ag additions"

C. Varanasi, R. Biggers, I. Maartense, E.K. Moser, D. Dempsey, D. Liptak, J. Busbee, G. Kozlowski, R. Nekkanti, T.L. Peterson and C.E. Oberly

MRS Spring Mtg., San Francisco, CA (31 Mar-4 Apr 1997)

"RF Sputtering of Biaxially-Textured YSZ Buffer Layer on Angular Oriented Metallic Substrate"

G. Kozlowski, G. Farlow, J. Hundley, C. Varanasi, R.R. Biggers, I. Maartense, R. Nekkanti, E.K. Moser, C.E. Oberly, T.L. Peterson, V. Selvamanickam, A. Ivanova, and A.E. Kaloyeros

MRS Spring Mtg., San Francisco, CA (31 Mar-4 Apr 1997)

"A Review of Ohmic Contacts to Gallium Nitride"

M.A. Capano

International Conf. on Metallurgical Coatings and Thin Films, San Diego CA (April 1997)

"Future tools for the mastery of light"

F.K. Hopkins

Physics Dept. Seminar, Northern KY Univ. (18 April 1997)

"Environmental testing of long wave infrared (LWIR) windows"

E.S. Kelly, R.J. Ondercin, J.A. Detrio and P.R. Greason

SPIE 11th Aerosense Conf on Window and Dome Technologies and Matls, Orlando, FL (20-25 April 1997)

"Diamond coated ZnS for improved erosion resistance"

R. Korenstein, L. Goldman, R. Hallock, R. Ondercin and E. Kelly

SPIE 11th Aerosense Conf on Window and Dome Technologies and Matls, Orlando, FL (20-25 April 1997)

"Refractive index measurements of barium titanate and implications for periodically QPM devices"

D.L. Small, D.E. Zelmon, L.E. Myers and P. Schunemann

Am. Phys. Soc., Ohio Section, Bowling Green State U., OH (2-3 May 1997)

"Effects of In doping on GaSe crystal quality and second harmonic generation"

N.C. Fernelius, F.K. Hopkins, D.R. Suhre, N.B. Singh and V. Balakrishna

Am. Phys. Soc., Ohio Section, Bowling Green State U., OH (2-3 May 1997)

"Dependence of nonlinear absorption in CdGeAs<sub>2</sub> on temperature, orientation and charge carrier density"

S. Guha, M.C. Ohmer and P.J. Hood and P.G. Schunemann

CLEO/QELS, Baltimore, MD (18-23 May 1997)

"Band Gap Engineered Design of QW and SL Structures for Optimum Performance IR Detectors"  
Frank Szmulowicz and Gail J. Brown  
University of Alabama at Huntsville (May 22, 1997)

"Current polymer research efforts at Wright Patterson AFB"  
S. Caracci  
1997 ONR/AFOSR Polymer Program Review, Jacksonville FL (June 1997)

"Optimizing the nonlinear semiconductors  $\text{ZnGeP}_2$  and  $\text{CdGeAs}_2$  for infrared laser applications"  
M.C. Ohmer  
American Vacuum Soc., OH Chapter 14th North Coast Symp., Cleveland, OH (5 June 1997)

"Deep levels due to vanadium in SiC"  
W.C. Mitchel  
1997 Awards Day Colloquium, Dept of Physics, U of Cincinnati, Cincinnati, OH (5 June 1997)

"Operational characteristics of organic crystals for NLO and EO applications"  
N.B. Singh, T. Rajalakshmi, I. Liberman, N. Fernelius, F.K. Hopkins and D.E. Zelmon  
Electronics Materials Conf., Fort Collins, CO (25-27 June 1997)

"Microwave characterization of high temperature superconductor films using dielectric resonator measurements"  
K. Naishadham and E.K. Moser  
Institute of Electrical and Electronic Engineers, Montreal, Canada (13-18 July 1997)

"Emission spectral-component monitoring for measurement and control of pulsed laser deposited HTS thin films"  
R.R. Biggers, J.D. Busbee and D. Lubbers  
Australasia-Pacific Forum on Intelligent Processing & Manufacturing of Materials (IPMM-97), Sidney, Australia (14-17 July 1997)

"Toward in-situ control for PLD of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  thin films utilizing Raman spectroscopy"  
J. Busbee, D. Liptak, R. Biggers, I. Maartense, C. Varanasi  
Australasia-Pacific Forum on Intelligent Processing & Manufacturing of Materials (IPMM-97), Sidney, Australia (14-17 July 1997)

"Nonlinear optical materials for frequency conversion and optical signal processing"  
S.J. Caracci, N.C. Fernelius, M.C. Ohmer, D.E. Zelmon and J.S. Zetts  
Phillips Laboratory 6th Annual Technical Interchange Symposium, Kirtland AFB, NM (16 July 1997)

"Thermal activation energies for the three in-equivalent lattice sites for the  $\text{B}_{\text{Si}}$  acceptor in 6H-SiC"  
A.O. Evwaraye, S.R. Smith, W.C. Mitchel and H. McD. Hobgood  
International Conf. on Defects in Semiconductors (ICDS-97), Aveiro, Portugal (21-25 July 97)

"GaN grown using trimethylgallium and triethylgallium"  
A. Saxler, P. Kung, X. Zhang, D. Walker, J. Solomon, W.C. Mitchel and M. Razeghi  
International Conf. on Defects in Semiconductors (ICDS-97), Aveiro, Portugal (21-25 July 97)

"Electroluminescence of III-Nitride double heterostructure light emitting diodes with silicon and magnesium doped InGaN"

A. Saxler, K.S. Kim, D. Walker, P. Kung, X. Zhang, G.J. Brown, W.C. Mitchel and M. Razeghi  
International Conf. on Defects in Semiconductors (ICDS-97), Aveiro, Portugal (21-25 July 97)

"GaN doped with sulfur"

A. Saxler, P. Kung, X. Zhang, D. Walker, J. Solomon, M. Ahoujja, W.C. Mitchel, H.R. Vydyanath and M. Razeghi  
International Conf. on Defects in Semiconductors (ICDS-97), Aveiro, Portugal (21-25 July 97)

"Combined Effects Testing of Long Wave Infrared (LWIR) Window Materials"

E. S. Kelly, R. J. Ondercin, J. A. Detrio, and L. M. Goldman  
1997 Meeting of IRIS Specialty Group on Infrared Materials  
Naval Post-Graduate School, Monterey, CA (28-29 July 1997)

"LANTIRN IR Window Evaluation Protocol"

J. A. Detrio, N. R. Osborne, E. S. Kelly, and R. J. Ondercin  
1997 Meeting of IRIS Specialty Group on Infrared Materials  
Naval Post-Graduate School, Monterey, CA (28-29 July 1997)

"Runway Debris Damage to LWIR Windows - Single Sand Particle Impact Damage"

J. A. Detrio, R. S. Bertke, L. M. Goldman, E. S. Kelly, and R. J. Ondercin  
1997 Meeting of IRIS Specialty Group on Infrared Materials  
Naval Post-Graduate School, Monterey, CA (28-29 July 1997)

"Durable Bonded Claddings for Aircraft IR Transparencies"

A. B. Harker, L. M. Goldman, R. Korenstein, R. J. Ondercin and E. S. Kelly  
1997 Meeting of IRIS Specialty Group on Infrared Materials  
Naval Post-Graduate School, Monterey, CA (28-29 July 1997)

"Characterization and modeling of GaAs/AlGaAs p-type multi-quantum wells for infrared detection at normal incidence"

G.J. Brown, W.T. Taferner, K.G. Eyink, S.M. Hegde, F. Szmulowicz and S.D. Walck  
5th International Symp. on Long Wavelength IR Detectors and Arrays: Physics and Applications. Joint International Mtg. of ECS, Paris, France (31 Aug-5 Sep 1997)

"Deep levels in SiC:V and high temperature transport measurements"

W.C. Mitchel, R.E. Perrin, J. Goldstein, M. Roth, M. Ahoujja, S.R. Smith, A.O. Evwaraye, J. Solomon, G. Landis, J. Jenny, Mc.D. Hobgood, G. Augustine and V. Balakrishna  
International Conf. on SiC, III-Nitrides and Related Materials, Stockholm, Sweden (1-5 September 1997)

"Phonon spectrum of band-to-band optical transitions in 6H-SiC as determined by optical admittance spectroscopy"

S.R. Smith, A.O. Evwaraye and W.C. Mitchel  
International Conf. on SiC, III-Nitrides and Related Materials, Stockholm, Sweden (1-5 September 1997)

"Structural characterization of SiC crystals grown by physical vapor transport"

E. Sanchez, G.S. Rohrer, M. Skowronski, J. Solomon, M.A. Capano and W. C. Mitchel

International Conf. on SiC, III-Nitrides and Related Materials, Stockholm, Sweden (1-5 September 1997)

"Minority Carrier Lifetime Measurements in 6H-SiC Using the Photoconductive Decay Technique"

W. Zhou, I. Khlebnikov, T. S. Sudarshan, M. A. Capano, and W. C. Mitchel

International Conf. on SiC, III-Nitrides and Related Materials, Stockholm, Sweden (1-5 September 1997)

"A comprehensive atomic-level simulator for AlGaAs/GaAs (001) MBE"

D.L. Dorsey, K. Mahalingam and R. Venkat

24th International Symp. on Compound Semiconductors - IEEE, San Diego, CA (7-11 September 1997)

"A Detailed Atomic-Level Simulation of AlGaAs/GaAs (001) Heterointerface Formation"

D.L. Dorsey

U. Nevada - Las Vegas, Las Vegas, NV (12 Sept 1997)

"Emission Spectral-Component Monitoring for Measurement and Control of Pulsed Laser Deposited High Temperature Superconducting Thin Films"

R.R. Biggers

University of Dayton Physics Seminar, University of Dayton (11 September 1997)

"Modified GaSe crystals for 2-5 and 8-14  $\mu\text{m}$  wavelength applications"

N.B. Singh, D.R. Suhre, T. Rajalakshmi, R. Narayanan, V. Balakrishna, M.L. Marable, P.H. Mui, R. Jones, N.C. Fernelius, S.J. Caracci, F.K. Hopkins and D.E. Zelmon

ACCGE/east-97: East. Regional Conf. on Cryst. Growth & Epitaxy, Atlantic City, NJ (28Sept-1 Oct 1997)

"Current status of nonlinear optical crystal development at USAF Materials Directorate"

N.C. Fernelius, F.K. Hopkins and S.J. Caracci

ACCGE/east-97: Eastern Regional Conf. on Cryst. Growth & Epitaxy, Atlantic City, NJ (28Sept-1 Oct 1997)

"Pixelless infrared imaging using quantum wells"

G.J. Brown and F. Szmulowicz

AGARD 7th Symp. on Multi-Sensor Systems and Data Fusion for Telecommunications, Remote Sensing and Radar, Lisbon, Portugal (29 Sep-2 Oct 1997)

"Nonlinear optical frequency conversion materials for multi-band remote sensing and surveillance"

S. Caracci, N. Fernelius, M. Ohmer and D. Zelmon

AGARD 7th Symp. on Multi-Sensor Systems and Data Fusion for Telecommunications, Remote Sensing and Radar, Lisbon, Portugal (29 Sep-2 Oct 1997)

#### **Papers Submitted/Accepted for Presentation in FY98**

"Influence of Host Environment on the Poling Characteristics and Chromophore-Chromophore Interactions in Electro-Optic Guest-Host Polymer Systems"

M. D. Alexander Jr., R. A. Vaia, M. Banach, S. J. Caracci, B. Reinhardt and R. Spry

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Operational characteristics of GaSe crystals for mid-IR and far-IR applications”

N.C. Fernelius, F.K. Hopkins, N.B. Singh, D. Suhre, M. Marable, R.H. Hopkins, R. Meyer and P. Mui

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Frequency doubling of CW and pulsed CO<sub>2</sub> lasers using diffusion-bonded, quasi-phase-matched GaAs stacks”

Symposium F: Infrared Applications of Semiconductors II

M.C. Ohmer, S. Guha, R.E. Perrin, L.S. Rea, P.W. Yu and A. Fathimulla

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Modeling of the properties of dopants in ZnGeP<sub>2</sub>”

R. Pandey, M.C. Ohmer, J.M. Recio and A. Costales

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Laser damage studies of silver gallium sulfide single crystals”

W. Ruderman, J. Maffetone and D.E. Zelmon

Symposium F: Infrared Applications of Semiconductors II-NonLinear optical and OPO Materials

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Refractive index measurements of barium titanate from 0.4 to 5.0 microns and implications for periodically poled frequency conversion devices”

D.E. Zelmon, D.L. Small and P. Schunemann

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Characterization of CdGeAs<sub>2</sub> using capacitance methods”

S.R. Smith, A.O. Evwaraye and M.C. Ohmer

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Polarized Raman scattering studies of chalcopyrite ZnGeP<sub>2</sub> single crystals”

S. Tlali, H.E. Jackson, M.C. Ohmer, P.G. Schunemann and T.M. Pollak

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“ENDOR characterization of the zinc vacancy in anisotropic germanium diphosphide”

K.T. Stevens, S.D. Setzler, L.E. Halliburton, N.C. Fernelius, P.G. Schunemann and T.M. Pollak

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

“Photoresponse studies of the polarization dependence of the cadmium germanium arsenide band edge”

G.J. Brown, M.C. Ohmer and P.G. Schunemann

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Mid-IR photodetectors based on InAs/InGaSb type-II quantum wells"

G.J. Brown, M. Ahoujja, F. Szmulowicz, W.C. Mitchel and C.H. Lin

Symposium F: Infrared Applications of Semiconductors II

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

"Spectral component monitoring of the plumes generated during deposition of Re(Y,Nd)BaCuO films by pulsed laser ablation"

R. Biggers, C. Varanasi, I. Maartense, D. Dempsey, D. Mast, D. Liptak, J. Jones, T.L. Peterson, T. Murray and J. Busbee

Symposium II: In Situ Process Diagnostics and Intelligent Materials Processing

MRS Fall Mtg. Boston, MA (1-5 Dec 1997)

(Invited)

"Calculation and photoresponse measurement of the long-wavelength IR absorption in p-type GaAs/AlGaAs quantum wells and type-II InAs/InGaSb superlattices"

F. Szmulowicz, G.J. Brown, W.C. Mitchel, H.C. Liu, L. Li, M. Buchanan, Z.R. Wasilewski and C.H. Lin

International Workshop on Intersubband Transitions in Quantum Wells: Physics and Devices, Tainan, Taiwan (15-18 Dec 97)

"New developments in III-Nitride material and device applications"

M. Razeghi, A. Saxler, P. Kung, D. Walker, X. Zhang, K.S. Kim, H.R. Vydyanath, J. Solomon, M. Ahoujja and W.C. Mitchel

9th International Workshop on Physics of Semiconductor Devices (IWPSD), Delhi, India (16-20 Dec 97)

"Novel theoretical investigation of  $\text{As}^0_{\text{Ga}}$  and  $\text{As}^+_{\text{Ga}}$  incorporation in low temperature MBE of GaAs: Surface dynamics and Be influence"

K. Natarajan, R. Venkat and D.L. Dorsey

Physics and Chemistry of Semiconductor Interfaces (PCSI-25), Salt Lake City, UT (18-25 Jan 98)

" $\text{Sm}_2(\text{Co, Fe, Cu, Zr})_{17}$  magnets with improved thermal stability"

C.H. Chen, M.S. Walmer, M.H. Walmer, S. Liu, E. Kuhl and G. Simon

7th Joint MMM-Conf., Sponsored by the Amer. Institute of Phys., San Francisco, CA (6-9 January 1998)

"A one parameter model of heterointerface formation"

D.L. Dorsey, K. Mahalingam and R. Venkat

PCSI-25, Sponsored by the Am. Vac. Soc., Salt Lake City, UT (18-25 January 1998)

"Mid-infrared photodetectors based on the InAs/InGaSb type-II superlattice"

C.H. Lin, G.J. Brown, W.C. Mitchel, M. Ahoujja and F. Szmulowicz

Photodetectors: Materials and Devices III

SPIE Photonics West 98, San Jose, CA (28-30 Jan 1998)

"Growth and characterization of InAs/GaSb type-II superlattice for long wavelength infrared detectors"

H. Mohseni, E.J. Michel, M. Razeghi, W.C. Mitchel and G.J. Brown

Photodetectors: Materials and Devices III

SPIE Photonics West 98, San Jose, CA (28-30 Jan 1998)

"Responsivity and noise performance of InGaAs/InP quantum well infrared photodetectors grown by gas-source molecular beam epitaxy"

C. Jelen, S. Slivken, T. David, M. Razeghi and G.J. Brown

Photodetectors: Materials and Devices III

SPIE Photonics West 98, San Jose, CA (28-30 Jan 1998)

"Optical Absorption and photoluminescence in AgGaTe<sub>2</sub>"

J. Goldstein, M.C. Ohmer, C. Hegde, P. Schunemann and T. Pollak

APS March Mtg., Los Angeles, CA (16-20 Mar 98)

"Optical Absorption and photoluminescence in CdS<sub>x</sub>Se<sub>1-x</sub>:V"

J. Goldstein, M.C. Ohmer, C. Hegde, K-T Chen, Y-F Chen, S. Morgan and A. Burger

APS March Mtg., Los Angeles, CA (16-20 Mar 98)

"The effect of doping on nitrogen activation energy levels in 4H-SiC"

A.O. Evwaraye, S.R. Smith and W.C. Mitchel

MRS Spring Mtg., San Francisco, CA (12-17 April 1998)

"Aluminum acceptors in inequivalent sites in 4H-SiC"

A.O. Evwaraye, S.R. Smith and W.C. Mitchel

MRS Spring Mtg., San Francisco, CA (12-17 April 1998)

"Investigation of transition metal-xanthate complexes for nonlinear optical application"

D.E. Zelmon, Z. Gebeyehu, D. Tomlin and T.M. Cooper

Symposium O: Hybrid Materials

MRS Spring Mtg., San Francisco, CA (12-17 April 1998)

"An Evaluation of Combined Effects Test Conditions"

E. S. Kelly, R. J. Ondercin, J. A. Detrio, and L. M. Goldman

7th DoD Electromagnetic Window Symposium

Applied Physics Laboratory, Laurel Maryland (5-7 May 1998)

"Substrate Protection of Bonded Windows"

E. S. Kelly, R. J. Ondercin, A. B. Harker, L. M. Goldman, and J. A. Detrio

7th DoD Electromagnetic Window Symposium

Applied Physics Laboratory, Laurel Maryland (5-7 May 1998)

"Repairable LANTIRN IR Windows"

L. M. Goldman, A. B. Harker, R. Korenstein, J. K. Rawson, R. J. Ondercin, and E. S. Kelly

7th DoD Electromagnetic Window Symposium

Applied Physics Laboratory, Laurel Maryland (5-7 May 1998)

"The 1.1 eV deep level in 4H-SiC"

W.C. Mitchel, R.E. Perrin, J. Goldstein, S.R. Smith, J.S. Solomon, A.O. Exwaraye, G. Augustine and V. Balakrishna

10th Conference on Semiconducting and Insulating Materials, Berkeley, CA (1-5 June 1998)

"Multi-layer conduction in epitaxial InSb grown on GaAs substrates"

M. Ahoujja, W.C. Mitchel, E. Michel and M. Razeghi

10th Conference on Semiconducting and Insulating Materials, Berkeley, CA (1-5 June 1998)

"Modified GaSe crystals for mid-IR applications"

N.B. Singh, D.R. Suhre, R.H. Hopkins, M. Marable, R. Meyer, R. Narayanan, N.C. Fernelius, F.K.

Hopkins and D.E. Zelmon

International Conf. on Crystal Growth, Jerusalem, Israel (26-31 July 98)